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for the
District of Columbia Circuit

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RESPONDENT'S BRIEF AND APPENDIX

United States Court of Appeals

DISTRICT OF COLUMBIA

No. 9625

AMMIEL F. DECKER AND MABEL P. DECKER, INDIVIDUALS TRADING AND DOING BUSINESS AS DECKER PRODUCTS COMPANY, PETITIONERS

v.

FEDERAL TRADE COMMISSION, RESPONDENT

ON PETITION TO REVIEW AN ORDER OF THE FEDERAL TRADE COMMISSION

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DISTRICT OF COLUMBIA

No. 9625

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v.

FEDERAL TRADE COMMISSION, RESPONDENT

BRIEF FOR RESPONDENT

I

COUNTERSTATEMENT OF THE CASE

This is an administrative law proceeding arising upon petition to review and set aside an order to cease and desist issued by the Federal Trade Commission (Petitioners' App. pp. 41–42) pursuant to a complaint (Petitioners' App. p. 25) charging petitioners with engaging in unfair and deceptive acts and practices in violation of the Federal Trade Commission Act (52 Stat. 111; 15 U. S. C. A. sec. 45). The petitioners have also filed a motion to dismiss the complaint and proceedings before the Commission and for other relief, involving the same questions as those raised in petitioners' brief in connection with the petition to review. This motion was denied by the Court without prejudice on February 11, 1948. Petitioners renew this petition in their brief.

The petitioners Ammiel F. Decker and Mabel P. Decker, husband and wife (Tr. p. 5), sell a patented device in interstate commerce which was invented by the petitioner Ammiel F. Decker and is known by the trade name, Vacudex. Petitioner's device is a metal pipe approximately eight inches long and two and one-half inches in diameter, into the walls of which are set four cones at varying angles. The device clamps onto the end of the exhaust pipe or tail pipe of the automobile. As the vehicle moves forward, air is forced through the cones and according to petitioner's theory creates a spiral motion of the air in the exhaust pipe and eliminates or reduces the back pressure of the automobile (Findings, Par. 5, Resp. App. p. 24).

For the purpose of inducing the sale of the device, Vacudex, in interstate commerce, petitioners have represented that the device saves gasoline and oil; that it increases the power of the motor and causes it to give better performance; that it draws carbon, oil, and moisture from the muffler and eliminates back pressure; that it reduces the vibration of the motor; that it gives the motor greater acceleration, causes it to run more smoothly and saves tires (Findings, Par. 4, Resp. App., pp. 23–24).

Petitioners make no contention that these representations were not made but defend them on the ground that they are within the scope of the patent. After considering the evidence of tests and the testimony of experts introduced by the respondents [petitioners] and the result of tests by the National Bureau of Standards and the testimony of the Bureau of Standards' experts on automotive engines, the Commission found that all of these representations were false (Findings, Par. 7, Resp. App. pp. 25–26).

The Commission thereupon entered its order to cease and desist (Petitioners' App. pp. 41–42) wherein it commanded petitioners in connection with the sale of their device, Vacudex, to cease and desist from representing that said device will:

1. Eliminate or reduce back pressure.
2. Save gasoline or oil.
3. Increase the power of the motor or cause it to give better performance.
4. Draw carbon, oil, or moisture from the muffler.
5. Reduce the vibration of the motor.
6. Give the motor greater acceleration or cause it to run more smoothly or more quietly.
7. Save tires.

Petitioners' brief raises three questions only (brief, pp. 11–13):

1. Does the Federal Trade Commission as a matter of law lack jurisdiction to ban false and misleading advertising if the misleading representations concern a patented device and are within the scope of representations made to the Patent Office in connection with the application for the patent.

2. Assuming that the Commission has jurisdiction over such advertising has the Commission proved by substantial evidence as required by the Federal Trade Commission Act and the Administrative Procedure Act that petitioners' representations have the tendency and capacity to deceive.

3. Did the Commission exceed its discretion in reopening the case for the making of laboratory tests and for the taking of testimony as to the results of such tests.

II

SUMMARY OF ARGUMENT

Although the Commissioner of Patents does not test devices which are patented, the issuance of a patent is *prima facie* evidence that the device is operable. The decision of the Patent Office is not *res adjudicata,* however, and the *prima facie* evidence may be overcome by other evidence. The operability of a patented device is a question of fact, the determination of which is not forbidden to the Federal Trade Commission by the patent laws or other laws. The Federal Trade Commission in this proceeding has not attempted to determine a question arising under the patent laws but on the contrary has determined a question arising under the Federal Trade Commission Act. The fact that a patent is collaterally involved does not mean that the action arises under the patent laws. The Commission therefore may forbid misleading representations concerning a patented device even though the representations are within the scope of the patent. A patent, like a trade-mark, is not a license to engage in unfair competition. Furthermore, the device which petitioners sell differs from the patented device.

The Commission has proved by substantial evidence that petitioners' representations concerning the patented device, Vacudex, were misleading. This is the only finding which petitioners challenge in their brief. Although the record contains evidence supporting the petitioners' contention that these representations are true, the contrary evidence based on exhaustive tests by the National Bureau of Standards and the testimony of Bureau of Standards' witnesses is substantial evidence on the whole record that the representations are false. The Commission may decide conflicts in the evidence arising from the divergent opinions of different scientists and is not obliged to accept the opinion of petitioners' expert witnesses. The misleading character of the advertisements and of the representations banned by the order to cease and desist has been proved by substantial evidence.

The Commission did not err in reopening the case for the purpose of having a laboratory test of the device made and for the purpose of taking testimony showing the results of this test. The record showed that a laboratory test would be more accurate than the road test already in the record. Even the courts in the exercise of their discretion reopen cases for such purposes. Because of the legislative function served by administrative agencies, their discretion is even broader.

III

ARGUMENT

1. The Commission may by order to cease and desist forbid the use in advertisements of statements within the scope of a patent

The petitioners contend that the order to cease and desist should be set aside because the Commission denied petitioners' motion to dismiss the complaint on the ground that the statements forbidden are within the scope of the patent (Petitioners' brief pp. 13–21). By this petitioners seem to mean that the Commission cannot restrain them from asserting to be a fact anything which is asserted to be a fact in the application of petitioner Ammiel F. Decker for a patent (Petitioners' App. pp. 28–31). In this connection petitioners state that jurisdiction to try all issues arising out of patent rights is vested in the courts of the United States (Petitioners' brief,

p. 20). With this we agree. The Commission, however, has not attempted to try any issues arising out of patent rights. It has not attempted to test the validity of petitioners' patent; its order does not attempt to prevent petitioners from excluding others from making, using or vending the device, which is the only right the patent gives (*40 Am. Jur. Patents, Sec. 140*). The fact that a patent is collaterally involved does not mean that the action arises under the patent laws. *Aralac Inc.* v. *Hat Corporation of America,* 166 F. 2d 286, 296 (C. C. A. 3, 1948). The Commission has tried an issue arising under the Federal Trade Commission Act. That Act forbids false and misleading advertising. There is nothing in the Federal Trade Commission Act which makes any exceptions as to statements concerning patented devices; there is nothing in the patent laws which authorizes a patentee to disseminate misleading advertisements.

The petitioners' argument seems to be based on the theory that in issuing a patent, the Commissioner of Patents makes a final determination as to validity of claims which is *res adjudicata,* and therefore binding on other governmental agencies. Since all officers of the government are in privity, there are instances where the decision of one agency may be binding on other agencies. *United States* v. *Willard Tablet Co.,* 141 F. 2d 141, 143 (C. C. A. 7, 1944). That is not the case when the question of operability or utility arises after the issuance of a patent. It is a matter of common knowledge that the Commissioner of Patents does not make laboratory or other tests of patented devices. He has no laboratories or other equipment for doing so.

There is, of course, a presumption arising upon the issuance of a patent that the invention possesses utility. The burden of proving that it lacks utility is on the party asserting it (*48 C. J. 59*). This does not increase the burden already resting on the Commission to prove that petitioners have been guilty of unfair and deceptive acts and practices. Lack of utility may be evidenced by physical demonstration, by opinions of persons skilled in the art, and by testimony showing the results of experiments conducted for the purpose of determining the utility of the invention (*48 C. J. 59–60*).

The operability of a device for which a patent has been issued is frequently challenged in court, often with success, in infringement suits. *Dooley Improvements* v. *Motor Improvements,* 18 F. Supp. 340, 345 (D. Del. 1937), affirmed 66 F. 2d 553 (C. C. A. 3, 1933), cert. denied 290 U. S. 689 (1933); *Plant Products Company* v. *Charles H. Phillips Chemical Company,* 16 F. Supp. 553 (S. D. N. Y. 1936), aff'd 96 F. 2d 585 (C. C. A. 2, 1938).

The decision of the Patent Office does not render the question of the utility of the patented device *res adjudicata. Troy Laundry Machinery Co.* v. *Columbia Manufacturing Co.,* 217 F. 787, 789 (E. D. Pa. 1914).

The issuance of a patent is *prima facie* evidence of utility. *Strong-Scott Manufacturing Co.* v. *Weller,* 112 F. 2d 389, 394 (C. C. A. 8, 1940). The patent and the claims thereof are only presumptively valid, *Brodie* v. *Hydraulic Press Manufacturing Co.,* 151 F. 2d 91, 94 (C. C. A. 9, 1945). This court has repeatedly held that patents are presumptively valid. *Magnaflux Corporation* v. *Coe,* 78 App. D. C. 258, 139 F. 2d 531, 532 (1943); *Gebhard* v. *General Motors Sales Corp.,* 77 App. D. C. 331, 135 F. 2d 248, 249 (1943); *Akron Standard Mold Co.* v. *Coe,* 75 App. D. C. 171, 125 F. 2d 203 (1942); *Poulsen* v. *Coe,* 73 App. D. C. 324, 119 F. 2d 188 (1941); *Allison Coupon Co.* v. *Bank of Commerce and Savings,* 72 App. D. C. 82, 111 F. 2d 664 (1940).

The only effect, therefore, of the introduction of the patent in evidence was to raise a presumption that the device would do what was claimed for it. Substantial evidence to the contrary would overcome this presumption. The only question, therefore, is whether there is substantial evidence in the record that petitioners' advertised claims are misleading. This is the subject of another portion of this brief (Post pp. 7–15).

The cases cited (Petitioners' brief pp. 19–20) are not in point. Since the object of the patent laws is monopoly, *Bement* v. *National Harrow Company,* 186 U. S. 70 (1902), these cases merely hold that a contract which protects the monopoly allowed to patentees is not a violation of the antimonopoly statutes such as the Sherman Act and the Clayton Act. The patent laws create exceptions to such antimonopoly statutes but do not create exceptions to Section 5 of the Federal Trade Commission Act which forbids false and misleading advertising. *Army & Navy Trading Co.*, v. *Federal Trade Commission,* 66 App. D. C. 394, 88 F. 2d 776 (1937).

It has frequently been held that the Commission may in its order to cease and desist forbid the deceptive use of valid registered trade-marks. *Charles of the Ritz Distributors* v. *Federal Trade Commission,* 143 F. 2d 676, 679 (C. C. A. 2, 1944); *Marietta Manufacturing Company* v. *Federal Trade Commission,* 50 F. 2d 641, 642 (C. C. A. 7, 1931); *Federal Trade Commission* v. *Kay,* 35 F. 2d 160, 162 (C. C. A. 7, 1929), cert. denied 281 U. S. 764 (1930).

It is submitted that a patent, like a trade-mark "is not a license to engage in unfair competition." *Irwin* v. *Federal Trade Commission,* 143 F. 2d 316, 325 (C. C. A. 8, 1944).

Furthermore the record shows that the device which petitioners' sell and advertise differs from the patented device in three particulars. First, there is no attachment to the device forcing air into the cones. Secondly, there is no catalyst as described in the patent. Thirdly, the attachment on the end of the Vacudex described in the patent which forces exhaust gases down as they come out is not attached (Resp. App. p. 30). We submit that this difference in the devices nullifies all presumptions arising from the issuance of the patent.

2. The Commission has proved by substantial evidence on the entire record that the Petitioners' advertised representations concerning the device, Vacudex, are false and misleading

Before proceeding to a discussion of the tests made by the National Bureau of Standards and the testimony concerning them, it is necessary to correct the impression given by petitioners' brief as to the nature of these tests and the testimony concerning them. The tests are both referred to by petitioners as *ex parte* tests (Petitioners' brief, pp. 5, 22). The tests themselves were *ex parte* in the sense that they were not performed at the joint request of both parties. The original road test was performed at the request of the Petroleum Coordinator for War, not at the request of the Federal Trade

Commission (Petitioners' App. p. 32). He requested the test because of representations concerning the device, Vacudex, made by petitioner Ammiel F. Decker (Resp. App. pp. 31). The second test, the laboratory test, was made at the request of the Federal Trade Commission. There was nothing *ex parte* about the use made of the information obtained by an independent governmental agency, the National Bureau of Standards, in making these tests. This evidence was introduced at hearings attended by both parties where full opportunity for rebuttal testimony was afforded. In other words, the evidence was introduced in the usual way when scientists testify. The tests on which petitioners relied were *ex parte* in the same sense except that they were all performed at petitioners' solicitation.

The principal testimony concerning both the road test and the laboratory test was given by Clarence S. Bruce, an employee of the Bureau of Standards continuously from 1918 to 1945, where he has been in charge of automotive testing for four years (Resp. App. p. 31). He holds the degree of Master of Science from George Washington University (Resp. App. pp. 31–32), where he has also taught classes in internal combustion engines (Resp. App. p. 32). He has also taught in Columbia Tech in Washington and in other schools and is an experienced flyer. (Resp. App. p. 32.)

Mr. Bruce was not present when the actual road test was made but it was made under his direction (Resp. App. p. 53). The actual road test was made by Ronald E. Streets who testified that the official report of the Bureau of Standards (Comm. Ex. 11A–11D) was correct (Resp. App. p. 53). Donald B. Brooks, Section Chief of the Automotive Section was present at the road test (Resp. App. p. 56). To supplement the road test, Jesse T. Duck made tests under Mr. Bruce's direction (Resp. App. p. 67) at the Bureau of Standards to determine how much pressure change in the exhaust or back pressure would be needed for a one-mile-a-gallon increase in the gasoline mileage of a gasoline engine (Resp. App. p. 67). Ronald E. Streets has been employed in the Automotive Section of the Heat and Power Division of the Bureau of Standards for four and one-half years (Resp. App. p. 52). He has studied at the College of Idaho, majoring in chemistry for four years and has studied engineering at George Washington University (Resp. App. p. 52). He is employed at the Bureau of Standards to test automotive equipment (Resp. App. p. 52). His employment by a governmental agency and his testimony show him well qualified to make a road test under Mr. Bruce's direction.

Donald B. Brooks, Chief of the Automotive Section of the Bureau of Standards (Resp. App. p. 94) has been employed continuously at the Bureau since 1927 (Resp. App. p. 94). Most of his experience there has been with automobile engines (Resp. App. pp. 94–95). He holds the degrees of Bachelor of Chemical Engineering, Master of Science and Chemical Engineer (Resp. App. p. 95). Under the civil service system of the United States he is classified as a Principal Automotive Engineer (Resp. App. p. 95).

Jesse T. Duck has worked for a little less than three years at the Automotive Power Plant Department of the Bureau of Standards (Resp. App. p. 46). He has a Bachelor of Science Degree from Union University in Tennessee and has done graduate work in physics and mechanics (Resp. App. p. 47).

We submit that such witnesses may not properly be referred to as "student employees," and that attempts to make it appear that the tests were conducted by incompetents are futile (Petitioners' brief, p. 5).

The laboratory tests were also made under Mr. Bruce's direction at the Bureau of Standards (Resp. App. p. 77). The official report of the Bureau of Standards appears in Com. Ex. 13A through 13E (Resp. App. p. 77). Mr. Bruce was present at and participated in the working out of the details of the test (Resp. App. p. 81) and when some of the preliminary tests were made (Resp. App. p. 81) but was not present when the actual tests were made and did not make any of the actual measurements (Resp. App. p. 82). The tests were conducted in the same way as all other tests at the Bureau of Standards (Resp. App. p. 82). Subordinates make such tests (Resp. App. p. 82). In this case the actual tests were made by Mr. Duck and Mr. Robertson (Resp. App. p. 82). The report, Comm. Ex. 13A to 13E, was written by Mr. Duck (Resp. App. p. 82) although signed by Donald B. Brooks, the Chief of the Automotive Section, Heat and Power Division. The report, however, was approved by Mr. Bruce before it was issued (Resp. App. p. 82). The qualifications of all of the persons connected with this laboratory test, except Haywood L. Robertson, have already been described (*supra* pp. 8–9).

Mr. Robertson is employed in Heat and Power Division Three of the Bureau of Standards where he works under Mr. Duck (Resp. App. p. 89). He assisted Mr. Duck in making the laboratory test (Resp. App. p. 89), read the gas flow measuring device (Resp. App. p. 90), assisted in attaching the Vacudex (Resp. App. p. 90), and acted as general assistant to Mr. Duck. The record shows him to be an experienced mechanic. His testimony as a whole shows him to be intelligent and quite capable of acting as Mr. Duck's assistant.

The two tests and the testimony concerning them may now be considered. The petitioner Ammiel F. Decker, the inventor of Vacudex, testified that everything claimed for his invention and forbidden by the order to cease and desist was based on a reduction of back pressure which he claimed his invention effected (Resp. App. p. 30). Back pressure is the resistance to the flow of exhaust gases from the engine through the muffler and tail pipe (Resp. App. pp. 32, 33).

In the road tests made for the Petroleum Coordinator for War in 1942 (Resp. App. p. 32) two Vacudex devices supplied by petitioners were used (Comm. Ex. 11A). The Bureau of Standards in this test measured the back pressure on a 1942 Dodge ¾-ton pick-up truck and on a 1941 Ford V–8 sedan. The results of the tests on the Dodge are shown on Figure 1 (Comm. Ex. 11C) and those with the Ford on Figure 2 (Comm. Ex. 11D), (Resp. App. p. 33). The tests were made with a manometer, the details of the working of which may be difficult for laymen to understand but which were fully described by the witness Bruce (Resp. App. pp. 33–34). A manometer is the best device known for this test (Resp. App. p. 34). The test on the Dodge showed that fewer miles a gallon were obtained with the device Vacudex, than without it (Resp. App. pp. 34–35), and showed a slight increase in back pressure (Resp. App. p. 34). The test on the Ford showed that the back pressure with and without the device, Vacudex, is as nearly the same as it can be read and that the miles a gallon with and without the device are the same (Resp. App. p. 35). The conclusion of the witness Bruce from the tests on the two cars was that the device had no significant effect on fuel economy (Resp. App. p. 35). There is a possibility of a 10% error in a road test whereas in a dynamometer test there is a possibility of an error of only about 1% (Resp. App. p. 36).

Later, tests were made to determine how much back pressure would have to be removed to benefit the performance of an engine materially (Resp. App. p. 36). This was not a test of the device, Vacudex, but it showed that the road test with Vacudex was correct (Resp. App. p. 39). This independent test showed that it would require a four or five hundred horsepower blower to produce a reduction in pressure which would result in an economy of one mile a gallon (Resp. App. p. 39). Although a road test by itself is not as accurate as a dynamometer test in a laboratory, this independent test with a stationary engine demonstrates that there could be no appreciable saving of gasoline or increased efficiency attributable to Vacudex (Resp. App. p. 39). Vacudex could have no effect on mileage because it has no effect on back pressure (Resp. App. p. 39). The device, Vacudex, could have no effect on oil consumption as petitioners represented (Resp. App. p. 39), could not add fuel or pep to a motor (Resp. App. p. 39), could not draw carbon, oil, or moisture from the muffler (Resp. App. p. 39), could not reduce motor vibration (Resp. App. p. 41), could not cause a motor to run more smoothly or more quietly (Resp. App. p. 41), or save tires (Resp. App. p. 41).

In making these tests the Vacudex was attached in accordance with instructions contained in petitioners' literature (Resp. App. pp. 45, 53, 61) by employees of the Bureau of Standards whose qualifications have been described working under Mr. Bruce's direction (Resp. App. pp. 46, 53, 56, 57, 67). They made a correct report to Mr. Bruce of the tests made (Resp. App. pp. 53, 55, 67), and before making the tests inspected the entire exhaust assembly (Resp. App. p. 54). Four runs were made on a measured mile on Mount Vernon Highway both with and without the Vacudex (Resp. App. pp. 54, 64) at each speed of 20, 30, 40 and 50 miles, two runs in each direction (Resp. App. p. 64). Mr. Bruce was not present when the tests were made but was present when the equipment was assembled (Resp. App. p. 56). Although the man who conducted the road tests was not called as an expert but merely to show that he followed directions and made correct reports, the record shows that he was well educated and at least well qualified to make road tests (Resp. App. p. 52).

After the reopening of the case by the Commission on May 22, 1946, further tests were made by the Bureau of Standards in continuation of the tests described above (Comm. Ex. 13B). The report of the National Bureau of Standards is contained in Comm. Ex. 13A to 13E (Resp. App. p. 77). The laboratory tests were made between June 6 and June 25, 1946, under the direction of Mr. Bruce (Resp. App. p. 77). The Vacudex (Comm. Ex. 2A) was used in making this test (Resp. App. p. 77). A blower causing air to blow through the Vacudex was used to simulate conditions on a moving car (Resp. App. p. 78). These tests were made on a 1940 Ford V–8 engine with a Ford muffler (Resp. App. p. 83). The velocity of the air could be increased and decreased by means of a gate (Resp. App. p. 78). Comm. Ex. 13C is a chart showing the air speed at different gate settings (Resp. App. p. 78). Conditions were created which made the entire situation the same as with a moving car (Resp. App. pp. 79–81). This laboratory test is more accurate than a road test (Resp. App. p. 80). The test showed no difference in fuel consumption with or without the device (Resp. App. p. 81). There was no difference in the back pressure or the exhaust pressure (Resp. App. p. 81). The device had no measurable effect on engine operation (Resp. App. p. 81), did not increase the power of the engine (Resp. App. p. 81), did not draw carbon, oil, or moisture from the muffler (Resp. App. p. 81), did not reduce the vibration of the motor (Resp. App. p. 81), did not cause the motor to run more smoothly (Resp. App. p. 81), and did not reduce the strain or vibration of the engine (Resp. App. p. 81).

The witness Bruce did not see any of the measurements taken but participated in working out the results of the tests (Resp. App. p. 81). The tests were conducted under his direction and supervision (Resp. App. p. 82). The report was prepared by J. T. Duck (Resp. App. p. 84), Assistant Automotive Engineer at the Bureau of Standards. He actually made the tests

(Resp. App. p. 83) although the report is not over his signature (Resp. App. p. 84). He worked under the supervision of Mr. Bruce who outlined the procedure with him, saw the equipment after it was set up, and was present at trial runs of the engine and blower (Resp. App. pp. 84–85). On the stand Mr. Duck explained fully exactly what instruments were used and what was done in the tests (Resp. App. pp. 85–86). Like Mr. Bruce he testified that the Vacudex did not in any way affect the operation of the engine (Resp. App. p. 86), did not increase the power of the engine (Resp. App. p. 86), did not cause the engine to give better performance (Resp. App. p. 86), did not draw carbon, oil, or moisture from the muffler, did not reduce vibration, made no change in the acceleration of the engine, did not cause the engine to run more smoothly (Resp. App. p. 86). The Vacudex was attached in accordance with petitioners' instructions (Resp. App. pp. 86–87).

Thus the Commission's order to cease and desist is supported in every detail by official reports of the Bureau of Standards—one a road test made not at the request of the Federal Trade Commission but at the request of another governmental agency; the other a laboratory test made at the request of the Commission. The reports are supported by the testimony of experts employed by the Bureau and found qualified by the Civil Service Commission of the United States to make such tests. This is imposing evidence. The fact that the witness Bruce relied on reports made to him by persons working under his direction does not render his testimony inadmissable. An expert's testimony may be based on reports made by others or on facts established by the testimony of others without a showing that the witness himself determined the existence of the facts. *Carson* v. *Jackson,* 52 App. D. C., 51, 281 F. 411, 413–414 (1922); *Schooler* v. *State* (Tex. Civ. App. 1943) 175 S. W. 2d 664, 670; *Depfer* v. *Walker,* 123 Fla. 862, 169 So. 660, 664 (1936). The expert may state the results of experiments performed under his supervision. *Chicago Cosmetic Company* v. *City of Chicago,* 374 Ill. 384, 29 N. E. 2d 495, 499 (1940).

On the other hand the petitioners' case is supported by the testimony and reports of the interested inventor, one of the petitioners, and experts obtained by petitioners. Much of this testimony has been explained or discredited. Mr. Bruce, after examining the report of tests made by Dr. Frank D. Carvin (Resp. Ex. 4), on which petitioners rely heavily, analyzed that report and pointed out its errors (Resp. App. pp. 68–76). This testimony, of course, could be considered by the trier of the facts in determining the weight to be given to the report.

The Carvin Report (Respondents' Ex. 4) is inconsistent in itself. The record shows that only reduction in pressure in front of the muffler is important (Resp. App. p. 72). There is no dispute in the record about this point. Yet the Carvin report shows a reduction in pressure behind the muffler only at a speed of 40 miles an hour. At thirty miles an hour pressure before the muffler is reduced 0.1 (16.6—16.7). At twenty miles an hour pressure before the muffler is reduced from 4.8 to 4.3. This may be determined from an examination of the exhibit itself. In addition the Witness Bruce testified that this was what the report showed (Resp. App. pp. 68–76).

In the written report (Resp. Ex. 4, Paragraph 2, page 1) Witness Carvin said "Tests were made at constant engine speed and *constant throttle opening* for each car speed, first with the Vacudex on and then with the Vacudex removed." Yet in his oral testimony the same witness said "On these tests we maintained a constant r. p. m. as the fixed constant. If there is any improvement or not, it will show up in some other change, so we tried to maintain our speed constant, and then with Vacudex on and off, *we adjusted the* throttle of the engine to keep it at a constant speed" (Resp. App. p. 99).

Petitioners' witness Dutcher only made a road test (Resp. App. pp. 99–100). He testified that he found less than 10% saving of gasoline (Resp. App. p. 100). The record shows that there is a possibility of an error of 10% in a road test (Resp. App. p. 36). Petitioners' witness Arrigoni testified that he made the test on which he based his testimony as an official of the American Automobile Association, Contest Board Division (Resp. App. p. 101). The secretary of that association testified that Arrigoni was hired to supervise midget racing activities and had neither the authority nor the qualifications to make tests of this kind (Resp. App. pp. 93–94). This, of course, went to his credibility and competence.

It is not our intention, however, to assert that the record does not contain any evidence supporting petitioners' case. The Commission is the trier of the facts and its findings as to the facts if supported by substantial evidence are conclusive. *Federal Trade Commission* v. *Standard Education Society,* 302 U. S. 112, 117 (1937); *Federal Trade Commission* v. *Algoma Lumber Company,* 291 U. S. 67, 73 (1934); *Federal Trade Commission* v. *Pacific States Paper Trade Ass'n,* 273 U. S. 52, 63 (1927), as this court has held. *Federal Trade Commission* v. *Army & Navy Trading Co.,* 66 App. D. C. 394, 88 F. 2d 776, 778 (1937).

There is no reason to believe that the Commission did not consider the entire record (Petitioner's brief, pp. 21–22) as provided by the Administrative Procedure Act (5 U. S. C. A. 1006 [C]). In fact, the Commission stated in its findings that it had given consideration to the reports of tests introduced by respondents [Petitioners] and the testimony of witnesses in connection therewith (Resp. App. p. 25). The substantiality of evidence is not determined by the number of witnesses. The Commission's evidence is substantial on the entire record. The Commission must and may pass on conflicting evidence including conflicts in the opinions of scientists. *J. E. Todd Inc.* v. *Federal Trade Commission,* 79 App. D. C. 288, 145 F. 2d 858 (1944); *Justin Haynes & Co.* v. *Federal Trade Commission,* 105 F. 2d 988 (C. C. A. 2, 1939), cert. denied 308 U. S. 616 (1939); *E. Griffiths Hughes Inc.* v. *Federal Trade Commission,* 77 F. 2d 886 (C. C. A. 2, 1935). The Commission was not obliged to accept the opinion of petitioners' experts. *E. B. Muller & Co.* v. *Federal Trade Commission,* 142 F. 2d 511, 516 (C. C. A., 6, 1944).

3. The Commission did not err in reopening the case for a laboratory test

Petitioners assert that the Commission erred in reopening the case for a laboratory test of the device, Vacudex. This order was entered on the Commission's own motion after the taking of testimony had been closed and the case had been argued and taken under advisement by the Commission (Order reopening case dated May 22, 1946, Resp. App. pp. 26–27). In its consideration of the case the Commission reached the conclusion that laboratory tests of the device should be made. It reopened the case for the sole purpose of receiving in evidence the results of such tests together with such evidence as the respondents [petitioners] might wish to offer in rebuttal (idem). The record showed that a laboratory test would be more accurate than the road test which had been made (Resp. App. pp. 36, 55). Petitioners assume that the Commission reopened the case because it did not have sufficient evidence on which to base an order and was determined to find such evidence. The truth of the matter is that it could have based an order on the evidence as it stood at that time and that it reopened the case because of the possibility that a more accurate laboratory test might prove to be of advantage to petitioners. The laboratory test, however, confirmed the results of the road test. In the courts it is said that it cannot be an abuse of discretion to reopen a case for further evidence where the court permits the adverse party the same latitude in introducing further evidence (*64 C. J. 162*), as the Commission did here by permitting petitioners to offer any evidence they wished to in rebuttal (Resp. App. p. 27). Even in a jury case the court on its own motion may in its discretion admit further evidence after submission of the case to the jury (*64 C. J. 165*). "An [administrative] agency's right to grant a rehearing, reopening or reargument of an administrative proceeding, due to the legislative function served by administrative agencies, is virtually unlimited in the absence of statute". *Vom Baur, Federal Administrative Law* (1942) Section 318; cf. *Helvering* v. *Continental Oil Co.*, 63 App. D. C. 5, 68 F. 2d 750 (1933), cert. denied 292 U. S. 627 (1934).

IV

CONCLUSION

It is submitted that the Commission's order was properly entered. The Commission, therefore, prays that petitioners' petition to review be dismissed and that its motion to reverse the order of the Federal Trade Commission denying petitioners' motion to dismiss the complaint and proceedings before the Commission, which was denied by the court without prejudice on February 11, 1948, be now finally denied. The Commission further prays the court to enter its decree affirming the Commission's order and commanding the petitioners to obey the same and comply therewith pursuant to statute.[1]

WASHINGTON, D. C., *May 1948.*

W. T. KELLEY,
General Counsel,
WALTER B. WOODEN,
Associate General Counsel,
JAMES W. CASSEDY,
Assistant General Counsel,
DONOVAN DIVET,
Special Attorney,
Attorneys for Federal Trade Commission.

WASHINGTON, D. C., *May 1948.*

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[1] "To the extent that the order of the Commission is affirmed, the court shall thereupon issue its own order commanding obedience to the terms of such order of the Commission." Federal Trade Commission Act, Section 5 (c), 52 Stat. 113; 15 U. S. C. A., Section 45 (c).

RESPONDENT'S APPENDIX

RESPONDENT'S APPENDIX

Case No. 9625

UNITED STATES OF AMERICA

BEFORE FEDERAL TRADE COMMISSION

At a regular session of the Federal Trade Commission, held at its office in the City of Washington, D. C., on the 3d day of July A. D. 1947.

Commissioners: Garland S. Ferguson, Chairman; Ewin L. Davis, William A. Ayres, Robert E. Freer, Lowell B. Mason.

Docket No. 5097

IN THE MATTER OF AMMIEL F. DECKER AND MABLE P. DECKER, INDIVIDUALS TRADING AND DOING BUSINESS AS DECKER PRODUCTS COMPANY

FINDINGS AS TO THE FACTS AND CONCLUSION

Pursuant to the provisions of the Federal Trade Commission Act, the Federal Trade Commission on December 11, 1943, issued and subsequently served its complaint in this proceeding upon the respondents, Ammiel F. Decker and Mable P. Decker, individuals trading as Decker Products Company, charging them with the use of unfair and deceptive acts and practices in commerce in violation of the provisions of that Act. After the filing by the respondents of their answer to the complaint, testimony and other evidence in support of and in opposition to the allegations of the complaint were introduced before a trial examiner of the Commission theretofore duly designated by it, and such testimony and other evidence were duly recorded and filed in the office of the Commission. Thereafter the proceeding regularly came on for hearing before the Commission on the complaint, answer, testimony, and other evidence, report of the trial examiner upon the evidence and the exceptions to such report, briefs in support of and in opposition to the complaint, and oral argument of counsel; and the Commission, being of the opinion that further laboratory tests of respondents' product should be made and the results of such tests introduced into evidence, issued its order reopening the proceeding for the taking of further testimony and other evidence. Thereafter further testimony and other evidence with reference to results of tests were introduced before the trial examiner and such testimony and other evidence were duly recorded and filed in the office of the Commission. This proceeding again came on for final hearing before the Commission on the complaint, answer, testimony and other evidence, including testimony and other evidence introduced at supplemental hearings, report and supplemental report of the trial examiner and exceptions filed thereto, briefs and supplemental briefs filed in support of the complaint and in opposition thereto, and oral argument of counsel; and the Commission having duly considered the matter and being now fully advised in the premises, finds that this proceeding is in the interest of the public and makes this its findings as to the facts and its conclusion drawn therefrom:

FINDINGS AS TO THE FACTS

PARAGRAPH ONE. The respondents, Ammiel F. Decker and Mable P. Decker, are individuals trading and doing business under the name Decker Products Company, with their principal place of business located at 313 Fifth Avenue, Pelham, New York. Respondents are now, and for some five years last past have been, engaged in the sale and distribution of a mechanical device designated by them as "Vacudex" and designed to be attached to the end of the exhaust pipe or tail pipe of automobiles and trucks.

PARAGRAPH TWO. Respondents cause and have caused their device, when sold, to be transported from their place of business in the State of New York to purchasers thereof located in various other states of the United States. Respondents maintain and have maintained a course of trade in their device in commerce among and between various states of the United States.

PARAGRAPH THREE. In the course and conduct of their business and for the purpose of inducing the purchase of their device, respondents have made various representations with respect thereto, such representations having been disseminated among prospective purchasers by means of radio broadcasts and by means of advertisements inserted in newspapers, magazines, circulars, and other advertising material. Among and typical of such representations are the following:

> VACUDEX
>
> Saves Gas—Saves Tires
>
> The Vacudex is attached on the end of the tail pipe and constantly removes the exhaust like a vacuum cleaner draws dirt out of a rug. Carbon, Oil, and Moisture are removed and back pressure eliminated. That saves power because the motor does not have to drive the exhaust through the resistance of the muffler and pipes. Motor vibration is reduced. *Gasoline and oil are saved.*
>
> *Puts Pep in the Motor and Saves Tires*
>
> The added power makes the motor snappy and flexible with a fast, easy pick-up. It is not necessary to spin the wheels and grind off rubber to start the car moving. *That saves tires.*
>
> * * * * *
>
> More Power—More Pep.
> Improves Pick-up and Flexibility.
> Motors Run Smoother and Quieter.
>
> (Commission Exhibit 5.)

PARAGRAPH FOUR. Through the use of these representations and others of similar import respondents have represented, directly or by implication, that their device saves gasoline and oil, that it increases the power of the motor and causes it to give better performance; that it draws carbon, oil, and moisture from the muffler and eliminates back pressure; that it reduces the vibration of the motor; that it gives the motor greater acceleration and causes it to run more smoothly and more quietly; and that it saves tires.

PARAGRAPH FIVE. Respondents' device is a metal pipe approximately 8 inches long and 2½ inches in diameter, into the walls of which are set 4 cones, the cones being set at varying angles. The device clamps onto the end of the exhaust pipe or tail pipe of the automobile. As the vehicle moves forward air is forced through the cones and, according to respondents' theory, creates a spiral motion of the air in the exhaust pipe and eliminates or reduces the "back pressure" or exhaust pressure of the automobile.

The term "back pressure" as applied to an automobile engine means the resistance offered to the flow of the exhaust gases as they pass through the muffler and exhaust pipe. A part of the power produced by the engine must be used to overcome this resistance, i. e., to expel these gases, and respondents' theory is that their device, by eliminating or reducing back pressure, releases this part of the engine's power for the primary purpose of propelling the automobile. With the exception of certain minor matters not here involved, all of respondents' claims for their device are based upon this theory of the elimination or reduction of back pressure, it being conceded by them that if the device will not reduce back pressure it will not do any of the other things in question.

PARAGRAPH SIX. At the request of the Petroleum Coordinator for War, tests of respondents' device were made by the National Bureau of Standards in July 1942, and these tests showed that the device does not reduce back pressure. These tests were road tests, and such tests are not as accurate and reliable as laboratory tests. The range of experimental error in road tests is approximately ten percent, whereas the range in laboratory tests is only about one percent. However, certain laboratory tests in regard to back pressure were subsequently made by the Bureau. These laboratory tests, in which respondents' device was not used, were for the purpose of determining how much back pressure would have to be removed in order to affect the operation of an automobile engine. The tests showed that in order to bring about this result the reduction in back pressure would have to be very great—so great that, even after making full allowance for the possibility of experimental error in the road tests, it is evident that respondents' device can have no appreciable effect upon back pressure.

Subsequent laboratory tests were made by the National Bureau of Standards using respondents' device, Vacudex, which showed that the use of said device does not improve the performance of an engine in any way. These tests for power and economy were made on a Ford V–8 engine coupled to an electric dynamometer and equipped with a volumetric fuel meter, tachometer, manometers for measuring pressure in the intake valve and exhaust pipe, and other devices. Road, load, power and economy tests were made with air speed in the duct equal to the simulated road speed at which the engine was operating. The engine speeds and loads used were those computed as equivalent to road operation at 20, 30, 40, and 50 miles per hour. Two or more tests were made at 20 miles per hour with the Vacudex device attached; then runs were repeated with device removed. No change was made in the throttle setting before the Vacudex device was removed for the tests without the device. The speed and load were then changed and the Vacudex device was again attached and similar runs made until runs were made with and without the Vacudex device at 20, 30, 40, and 50 miles per hour. The results of these tests were that there was no measurable change in exhaust pressure, either before or after the muffler, when the Vacudex device was removed and that the Vacudex device has no measurable effect on fuel consumption, power, or engine performance.

Paragraph Seven. Based upon the results of tests conducted by the National Bureau of Standards and based upon testimony of the Bureau of Standards expert on automotive engines and after giving consideration to the evidence of tests and testimony of experts introduced by the respondents, the Commission finds that respondents' device, Vacudex, will not eliminate or reduce back pressure and is incapable of accomplishing the results claimed for it by the respondents. The Commission further finds that said device will not save gasoline or oil, increase the power of the motor, or cause the motor to give better performance. Said device will not draw carbon, oil, or moisture from the muffler and will not reduce the vibration of the motor. It will not give the motor greater acceleration or cause it to run more smoothly or more quietly. The use of said device will have no value in saving tires.

PARAGRAPH EIGHT. The Commission has given careful consideration to the reports of tests introduced by respondents and the testimony of witnesses in connection therewith and is of the opinion, and finds, that such testimony and other evidence do not overcome the greater weight of the testimony and other evidence introduced in support of the complaint.

PARAGRAPH NINE. The use by the respondents of the foregoing erroneous and misleading representations has the tendency and capacity to mislead and deceive a substantial portion of the purchasing public with respect to respondents' device and the results which may be accomplished through the use of such device, and the tendency and capacity to cause such portion of the public to purchase substantial quantities of respondents' device as a result of the erroneous and mistaken belief so engendered.

CONCLUSION

The acts and practices of the respondents as herein found are all to the prejudice of the Public and constitute unfair and deceptive acts and practices in commerce within the intent and meaning of the Federal Trade Commission Act.

By the Commission.

R. E. FREER,
Acting Chairman.

Dated this 3d day of July A. D. 1947.

Attest:

WM. P. GLENDENING, Jr.,
Acting Secretary.

ORDER REOPENING CASE

Dated May 22, 1946

This matter coming on to be heard by the Commission upon the record and the briefs and oral argument of counsel, and the Commission being of the opinion that further laboratory tests of respondents' product should be made and the results of such tests introduced in evidence:

It is ordered that this proceeding be, and it hereby is, reopened for the sole purpose of receiving in evidence the results of such tests, together with such evidence as may be offered by respondents in rebuttal thereof.

COMMISSION'S EXHIBIT 13–B

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Supplementary Report on Tests of "Vacudex" Submitted by Federal Trade Commission, Washington, D. C.

Sample Submitted

The tests reported herein are a continuation of tests of the Vacudex device begun in 1942 for the Office of the Petroleum Coordinator. When the Federal Trade Commission requested tests of the device in February 1943, the Bureau furnished an opinion based on the tests already made for the Petroleum Coordinator. Three members of the Bureau staff testified for the Commission at a hearing held before the Commission attorney on September 21, 1945.

The tests made at the Bureau showed that the device had no practical value. However, since certain evidence introduced at the hearing related to a device similar in principle to Vacudex, but of slightly different construction, the Commission believed it desirable to repeat these tests using a Vacudex device. A new sample Vacudex device was submitted and tested as shown below.

The Vacudex device tested is a sheet metal tube about 6 inches long, designed to fit over the tail pipe of an automobile. The end fastened to the tail pipe is divided for about 2 inches and can be clamped on tail pipe from about 2 to 2½ inches in diameter. The other end is about 2½ inches in diameter. Four smaller metal tubes tapered from about 1½ to ½ inches in diameter are led at an angle into the tube about midway in such a way that when the automobile is in motion air, it is claimed, is drawn in and mixed with the gases passing through the tail pipe. The manufacturer of Vacudex claims that the air enters in such a way as to create a lower pressure in the tail pipe, lowering the pressure at the exhaust port to an extent great enough to effect substantial savings in fuel, and to increase the engine power.

Summary

The tests showed that the Vacudex device does not improve the performance of an engine in any way.

Test Equipment and Procedure

Engine tests for power and economy were made on a 1940 Ford V–8 engine coupled to an electric dynamometer and equipped with a volumetric fuel meter, tachometer, manometers for measuring pressures in the intake manifold and exhaust pipe, and other devices. The engine was equipped with exhaust pipe, muffler, and tail pipe. The tail pipe was led through the end of a 10-inch sheet metal duct through which air could be blown to simulate air currents in road operation.

The blower used to force air through the duct was a centrifugal type, manufactured by the Buffalo Forge Company. It was powered by a 50-hp. Crocker-Wheeler electric motor, and had a rated output of 4,000 cubic feet per minute. The inlet and outlet orifices were 10 inches in diameter. The air speed through the duct was varied by use of a sliding gate over the inlet orifice. A scale graduated in inches was fastened alongside the gate to mark its position. A pitotstatic tube was used to measure the velocity pressures at points on the horizontal and vertical traverses of the ducts, with the blower in operation at several inlet gate positions. The wind velocities were computed by use of the formula

$$V=66.2\sqrt{h}$$

where V=the velocity of the air in feet per second at sea level density and h=the velocity pressure in inches of water. The average velocity of air in the duct was computed for several blower inlet-gate positions, and the velocities were plotted against gate scale positions as shown on the attached graph, Figure 1.

A photograph of the test set-up is attached.

Road load power and economy tests were made with air speed in the duct equal to the simulated road speed at which the engine was operating. The engine speeds and loads used were those computed as equivalent to road operation at 20, 30, 40, and 50 miles per hour. Two or more tests were made at 20 miles per hour with the Vacudex device attached, then the runs were repeated with the device removed. No change was made in the throttle setting before the Vacudex device was removed for the tests without the device. The speed and load were then changed for another speed and the Vacudex device was again attached and similar runs were made until runs were made with and without Vacudex at 20, 30, 40, and 50 miles per hour.

Results and Discussion

There was no measurable change in exhaust pressure either before or after the muffler when the Vacudex device was removed. The computed fuel consumption in miles per gallon is shown in the table below:

Computed road speed, m. p. h.	Miles per gallon with Vacudex	Miles per gallon without Vacudex
20	21.1	21.05
30	21.78	21.74
40	21.35	21.32
50	18.4	18.4
Average all speeds	20.66	20.63

Since there was no change in the exhaust pressure when Vacudex was used the very small difference in mileage could not have been due to Vacudex. Tests made at the Bureau have shown that a change in exhaust pressure becomes measurable long before it is effective. The Vacudex device is therefore of no value because it makes no change in the operating conditions of the engine.

Conclusion

The Vacudex device has no measurable effect on fuel consumption, power, or engine performance.

For the Director,

By DONALD B. BROOKS,
Chief of Automotive Section,
Heat and Power Division.

Test No. 374–13–46.
WASHINGTON, D. C., *June 25, 1946.*
JTD:DIP, III–7.

TESTIMONY OF AMMIEL F. DECKER

Q. Just a minute; I have another question I want to ask you. You are the inventor, I believe you stated, of this Vacudex?—A. Yes, sir.

Q. Just tell us how it works, please, sir.—A. Well, it does not work—the first thing to be considered about it is that it only works on a moving vehicle. It is operated entirely by wind pressure in its present form, although my patent provides for forcing air from a pump, either a vacuum or flow of fan pump, to add additional air if I want to.

Q. But this device is sold and advertised by you——A. I have made those but have not offered them for sale.

Q. How does Vacudex save gas and oil?—A. By reducing back pressure. My whole patent is based on the reduction of back pressure (Tr. 14, lines 6–20).

Q. So that the article that you advertise and sell differs from the patent in three provisions; first, there is no attachment to it for forcing air into the cones; second, there is no catalyst in the article that you sell which is described in the patent; is that correct?—A. That is right.

Q. And, third, the attachment on the end of the Vacudex described in the patent, which forces the exhaust gases down as they come out, is not attached to the article that you advertise?—A. Not the present one.

Q. It was not attached to these that were advertised in the Commission's Exhibits that are in evidence?—A. No, sir (Tr. 24, line 25 to line 13, p. 25).

* * * * *

A. * * * The exhaust that comes from the engine has to be driven by the motor through the tail pipe, through the muffler and the tail pipe and the more resistance there is to the flow, the greater is the loss of power. I do not mean by that that the engine makes less power, but I mean there is less power to drive the car.

Q. What becomes of the power?—A. It is used to drive the exhaust through the muffler and tail pipe (Tr. 37, lines 5–13).

Q. Mr. Decker, you submitted this device, Vacudex, to the Bureau of Standards for testing, did you not?—A. Yes, sir.

Q. That is all. I would now like to put Mr. Bruce on the stand.

Mr. HALL. I have a question I would like to ask.

Recross-examination by Mr. HALL:

Q. What did they say when you submitted it to them; who did you talk to?—A. I did not talk to anyone. I telegraphed to Mr. Ickes and Mr. Henderson saying I thought I could help him in saving gas when it was so short, and they advised me that an everyday test should be made and suggested the Bureau of Standards make an actual everyday test. So I wrote to the Bureau of Standards and got a letter back saying they did not usually make civilian tests. I wrote back and sent a copy of the letter from Mr. Frye and then they said to send the samples, which I did (Tr. 64, line 12 to line 5, p. 65).

(TESTIMONY OF CLARENCE S. BRUCE)

Q. Your name is Clarence S. Bruce?—A. That is right, sir.

Q. Where do you live, Mr. Bruce?—A. 1725 Lanier Place, Northwest, Washington, D. C.

Q. Are you an employee of the National Bureau of Standards?—A. Yes, sir.

Q. How long have you been employed there?—A. From 1918 to 1945.

Q. Continuously?—A. Yes, sir.

Q. What kind of work do you do there, Mr. Bruce?—A. I am in the Dynamometer Laboratory and am in charge of automotive testing.

Q. How long have you been in that position?—A. I have been in charge about four years.

Q. You are an automotive engineer?—A. My title at the Bureau of Standards is Automotive Engineer.

Q. Mr. Bruce, aside from your experience there at the Bureau of Standards, what educational qualifications do you have along that line?—A. I have a Master of Science degree in mechanical engineering from George Washington University here in the city.

Q. Have you also taught some in the University here?—A. Yes, sir; I taught seven or eight classes in internal-combustion engines at George Washington.

Q. Has all of your work at the Bureau of Standards been with automotive equipment and internal combustion engines?—A. Yes; with the exception of about three years in which I worked on explosions, flame propulsion.

Q. When did you receive your degree from the University here?—A. 1929.

Q. Mr. Bruce, is there anything else that you might add concerning your qualifications as an automotive engineer? The Commission would like to have in full all of a man's qualifications in a case of this kind.—A. I taught internal-combustion engines in various schools.

Q. When and where?—A. Here in Washington. The Columbia Tech is one of them. I also have a pilot's license and have flown about 15 years. I have also had a yacht for 18 years.

Q. Now, the respondents in this case advertise and sell a device which they call a Vacudex. which is an exhaust attachment for the exhaust of a gasoline engine; are you acquainted with that device or familiar with that device?—A. Yes, sir; I am.

Q. Was that device tested at the Bureau of Standards under your supervision?—A. It was.

Q. I believe the test was originally made for the Petroleum Coordinator for War, was it not?—A. Yes; the first road test we made was for the Petroleum Coordinator for War (Tr. 65, line 20 to line 24, p. 67).

* * * * *

Q. Mr. Bruce, the respondents have advertised that this device, Vacudex——

Trial Examiner Duvall. You are not offering that in evidence now?

Mr. Callaway. In just a minute.

Trial Examiner Duvall. All right.

By Mr. CALLAWAY:

Q. Saves gas and oil; that it adds 18 to 50 miles more a tank full and also adds power and pep to the motor and creates a suction like a vacuum cleaner and draws carbon oil and moisture from the muffler and thereby eliminates back pressure; that it saves mufflers and tail pipes; that motor vibration is reduced and deadly monoxide gas is reduced; that it improves pick-up and flexibility and that motors run smoother and quieter and muffler last longer and that it saves tires. In the tests made at the Bureau of Standards under your supervision did you find these advertising claims of the respondents to be true or false?—A. We found that it had no effect whatsoever on the operation of the engine.

Q. Now, respondent states in his evidence this morning that most of the benefits which he claims flow from the claim of eliminating back pressure. What is understood by the term "back pressure" when applied to a gasoline engine——A. The back pressure of an engine is that pressure necessary to exhaust the gases from the muffler and tail pipe.

Q. You mean it is the resistance they offer?—A. Resistance to flow of the exhaust gases.

Q. Now in this test, Mr. Bruce, did you measure the back pressure?—A. May I look at the report?

Q. Yes, sir [handing report to the witness]—A. Yes, we did, and the results of the back pressure tests are given in figure 1 and also in figure 2. Figure 1 is with a 1942 Dodge ¾-ton pick-up, and figure 2 is with a 1941 Ford V–8 four door sedan (Tr. 68, line 16 to line 2 p. 70).

* * * * *

Q. Now, Mr. Bruce, in these tests what device did you have for measuring back pressure?—A. We used a water manometer attached to the exhaust manifold of the engine.

Q. How does that work?—A. A water manometer is a U-tube filled with water and the pressure depresses the sides of the tube attached to the exhaust manifold if there is a pressure. If there is negative pressure, it will rise on one side and lower in the other one. The pressure reading is different in milliliters of waterhead, one way or the other, up and down, and 32 feet of water being 15 pounds per square inch. Of course a milliliter of water is a very small amount of water.

Q. Is that a reliable device for measuring back pressure?—A. Yes, sir; it is the best we know.

Q. You say that was attached to the engine?—A. Yes, sir; it is attached to the exhaust manifold of the engine.

Q. Now, I wish you would take that report, Mr. Bruce, Commission's Exhibit 11–A to 11–D and explain the report and charts and just what you did and what is shown there.—A. We attached, first to a Ford V–8, 1941, the manometer for reading back pressure and a tank and burette system for measuring fuel consumption.

Q. What is a burette?—A. A burette is a glass tube graduated in milliliters of liquid, and on a run through a measured mile at constant speed on a level concrete road and reading the burette when you pass the beginning of the mile and again at the end of the mile, you get the amount of fuel consumed during the mile and during that mile the exhaust back pressure was also read so that when we finished the mile you had a measure of the amount of fuel used and the amount of exhaust back pressure during the steady running.

Q. What did you find?—A. Referring to Commission's Exhibit 11–A, the top curve shows the exhaust manifold back pressure in milliliters of water clocked against car speed in miles per hour. The circles shows the points obtained with the Vacudex thus attached, and the X's show the points without the device. It will be seen the pressure in the exhaust manifold was greater with the device than without; a small amount.

Q. You tested this on both a Dodge and a Ford?—A. Yes; and this is the Dodge. At the bottom is shown the miles per gallon clocked against the car speed in miles per hour and shows the fuel consumed was less without the device—with the device.

Q. Which do you mean?—A. There were fewer miles per gallon obtained with the device than without.

Q. In other words, if I understand you, on the test on the Dodge the results showed a slight increase in back pressure with the device attached and a corresponding decrease in miles per gallon of gasoline, as against the engine operated without the device?—A. That is correct.

Q. Now, what did you find with the Ford?—A. I might state here that this difference is small and is well within the range of experimental error of such tests, a road test being only about 1/10 as accurate as a dynamometer test.

Q. Go right ahead.—A. On figure 2, Commission's Exhibit 11–D, we have the same information for the results on a 1941 Ford V–8, four-door sedan, and it shows that the manifold back pressure with and without the device is as near the same as it can be read and that the miles per gallon clocked against car speed is also the same with and without the device.

Q. Then, what was your conclusion from those two tests?—A. Our conclusion from those tests was that the device had no significant effect on fuel economy and hence the device would appear to have no merit in connection with conservation of petroleum.

Q. You were really testing it at that time for the saving in fuel; that was the real purpose of the test?—A. That was what we were interested in because the fuel Coordinator for War's duty was to pick up devices which would save gasoline.

Q. I understand, Mr. Bruce, the respondents claim for their device is based on the theory that the cones, as they are set in the device, cause a whirling motion of the air which creates a suction through the exhaust, thereby reducing back pressure. If this device does not have the effect of reducing back pressure, how could it be of benefit in the operation of an automobile or in any other manner so far as affecting the action of the engine?—A. I would say that the device, if it does not change the device, if it does not change the pressure in the exhaust manifold, could have no effect whatsoever on the operation of the engine.

Q. The elimination of the back pressure in a gasoline engine would be of benefit in the operation of an engine, would it not?—A. Yes, sir.

Q. And in this test about which you have testified, or these tests, you are able to determine and measure definitely whether the back pressure was affected or not?—A. Yes, sir. These curves which I have described show exactly what the back pressure was at each car speed.

Q. This was a road test, was it not?—A. Yes, sir.

Q. And I believe you said that the range of experimental error in road tests is approximately 10 percent, or something like that?—A. The accuracy is probably within 10 percent, whereas a dynamometer test is within about 1 percent.

Q. Was there later made at the Bureau of Standards under your direction another test in which you determined how much an engine's performance would be benefited by the removal of the back pressure or exhaust pressure, as we might call it?—A. Yes, sir; there was.

Q. This last test was not made with a Vacudex, was it?—A. No, sir (Tr. 70, line 15 to line 1 p. 75).

* * * * *

Q. This last test you made would only be of value in this case for the purpose of determining how much back pressure would have to be removed to materially benefit the performance of an engine; is that right?—A. Yes, sir. In other words, we made tests to determine what was the effective change of back pressure on an engine and how it would affect the power and fuel consumption.

Q. Did you determine in the last test how much pressure change in the exhaust or back pressure would be needed for one mile per gallon increase in gasoline mileage?—A. Yes, sir.

Q. Explain what you found there.—A. We again ran the engine—this test was on a stationary engine.

Q. On a stationary engine?—A. On a stationary engine in the laboratory, attached to a dynamometer which eliminates the wind resistance, the effect of road, the effect of variation of air currents, the temperature of the differential and the temperature of the transmission, and we can, by measuring the power of the engines in the laboratory, correct the horse power for barometric pressure, temperature, and humidity and thus we can compare one test with another and do not have to depend on picking two tests that are alike.

Q. All right. Just explain the feature of that test and what you found in regard to how much change in pressure would be needed for one mile per gallon increase in gasoline mileage.—A. The simplest explanation is in figure 1 here (Tr. 75, line 13 to line 16 p. 76).

* * * * *

Q. Mr. Bruce, I hand you a paper which has been marked for identification as "Commission's Exhibit number 12" and ask you what that is.—A. That is a curve obtained from laboratory tests of engine fuel consumption taken in the laboratory on a dynamometer in which the exhaust was subjected to various pressures above and below atmospheric, and the fuel consumption was measured at these various pressures on the exhaust to determine what the fuel consumption would be, and they were taken at the horsepower to give road load at these various speeds, thus duplicating road operation of an automobile as nearly as possible in the laboratory, where we could control conditions.

Q. Explain the top curve on that page (Tr. 77, line 2 to line 14, p. 77).

* * * * *

Mr. CALLAWAY. As I stated before, the only purpose of offering this is to show how much pressure change is needed to obtain a one mile per gallon increase in gasoline mileage. It was made in connection with the testing of another device, but we are not trying the other device, and this particular thing that he found which is attached to his report on another device is true regardless of the device. So I am merely offering it for the purpose of making that proof (Tr. 78, line 19 to line 26).

* * * * *

Q. Will you state for the record just what you said a minute ago, Mr. Bruce? Does Commission's Exhibit No. 12 have anything to do with the tests you made with "Gasconomy"?—A. It has nothing to do with the tests made either with Gasconomy or Vacudex; it merely shows what change in horsepower and economy you would get if you changed the pressure. Vacudex did not change the pressure, so it could not have anything to do with this test at all (Tr. 79, line 8 to line 16).

* * * * *

By Mr. CALLAWAY:

Q. Now, then, just explain those curves on Commission's Exhibit 12, please, sir.—A. The bottom curve is the curve of the change in exhaust manifold pressure because air was run at various speeds by the exhaust pipe just as you would in a car on the road.

Q. Did you force air through the exhaust pipe of that engine?—A. A 50-horsepower electric motor shoved air by the exhaust pipe.

Q. Through the exhaust pipe?—A. By the exhaust pipe.

Q. By it?—A. Yes.

Q. What do you mean when you say "by the exhaust pipe"; I do not know what you mean.—A. I do not either. I will take that back. This is not running the air by the exhaust pipe. We merely exhausted the air to go below atmospheric pressure and built up pressure by closing a valve in the exhaust pipe to get pressures above atmospheric pressure.

Q. Now, by a device which you constructed there in the laboratory, you changed the exhaust pressure in your stationary engine both above and below atmospheric pressure; is that right?—A. Yes, sir.

Q. Now then, go ahead and explain what that curve is that you were explaining there.—A. The fuel consumption was measured at various exhaust manifold pressures, both above and below atmospheric pressure.

Q. And that is what that bottom curve is?—A. No; the bottom curve is the curve of the exhaust back pressure at these various car speeds. In other words, if you ran the engine at higher and higher speeds, you would build up a greater pressure in the exhaust pipe. So that the bottom curve is the pressure built up in the exhaust pipe with a normal muffler on it.

Q. All right. What is the top curve?—A. The top curve is the pressure necessary to improve the—the reduction of pressure necessary to improve the fuel consumption one mile per gallon.

Q. All right. Those two curves seem to be pretty far apart on that graph.—A. They are, and it would take a lot of power to get that much reduction in pressure.

Q. All right. Did that test which you have just explained and which you have clocked there on Exhibit No. 12—did that test show to you that your road tests with Vacudex were comparatively correct?—A. That is true. The difference of pressure was negligible, or very small, with the device and without the device.

Q. That is the Vacudex?—A. Yes. Now, we actually changed the pressure on exhaust to see how much you would have to vary it to get this improvement in economy of one mile per gallon, and we find it is a very large amount of pressure, and that it would take a four or five hundred horsepower blower to produce any such reduction in pressure.

Q. So that although your test with the Vacudex was a road test, which is not as reliable as a dynamometer test, the stationary engine test, this latter test which you ran, as shown by Commission's Exhibit No. 12, demonstrates further, does it not that there would be no appreciable savings of gasoline or increased efficiency on account of the Vacudex; is that right?—A. That is correct, sir.

Q. Now, then, based on those tests that you made and upon your knowledge as an automotive engineer, does Vacudex save gasoline or increase the mileage to be obtained from a tank of gasoline?—A. Vacudex could have no effect on the mileage because it has no effect on back pressure.

Q. Does it or could it possibly save oil?—A. It has no effect on the back pressure and that is the only thing which could affect the engine and therefore it could not affect the oil consumption of that engine.

Q. Your answer would be the same I take it, when I ask you does it or could it add power or pep to a motor.—A. It would be the same.

Q. Now, another one of the respondents' contentions is that Vacudex draws carbon, oil and moisture from the muffler. Does Vacudex, or could it, draw carbon, oil or moisture from the muffler, or assist in their removal?—A. If the Vacudex drew anything from the muffler it would reduce the back pressure in the exhaust manifold, and it did not reduce the pressure in the exhaust manifold and therefore could not have drawn anything from the muffler.

Q. Does it or could it save the muffler or increase the life of a muffler of an automobile engine—is that the same question in another form?—A. Well, the condensation in the muffler causes a rusting, and if this device would increase the condensation it would increase the rusting, and if it decreased the condensation by keeping the muffler hotter than it was before by having something stuck on the outer end, it is possible it could have some effect on the rusting of the muffler; whether it would be good or bad, I could not say.

Q. Did it or could it save tail pipes or increase the life of tail pipes?—A. The tail pipe rusts more rapidly then the rest of the muffler, and if you stick something on the end of the tail pipe it is conceivable you might change the rusting from the tail pipe back to this device, which would be the last in line.

Q. What causes a tail pipe to rust, ordinarily?—A. The condensation of water, which has a small amount of sulphuric acid in it.

Q. Now, this condensation in the tail pipe, is that done while the engine is running or after it has stopped?—A. It is probably during the starting period and after it has stopped, and of course this device would have no effect on the amount of condensation or the amount of water or sulphuric acid formed.

Q. Let me ask you this: If this device forces additional air into the tail pipe—but it does not do that, does it?

Q. Strike that. Would the temperature of the tail pipe have anything to do with the condensation, and if so, how would it affect it?—A. That is part of the statement made before, namely that if it acted to make the tail pipe warmer, you would not get condensation in the tail pipe quite as quickly; so it is possible under some conditions that you might not get condensation in the tail pipe with the device on, where you did without it, but the same amount of rusting would occur in the device, probably.

Q. Now, if this device were to create a suction, then what would be the effect on the temperature in the tail pipe?—A. I do not believe it would have any effect if it created a suction.

Q. It would neither raise nor lower the temperature?—A. No. The exhaust gases would still be the same temperature passing through the pipe so the pipe would be the same temperature.

Q. Could this device reduce motor vibration?—A. It could not.

Q. Does it or could it reduce the carbon monoxide gas coming through the exhaust?—A. It could not.

Q. Why do you say that?—A. Because it has no effect on engine operation and therefore would have no effect on exhaust gas, the temperature, pressure, or anything else.

Q. These cones inserted in the Vacudex, as I understand from the respondents, the theory is they dilute the carbon monoxide gas coming out; what would you say to that?—A. I would say the small amount of air running through those cones is rather insignificant compared to the large volume of air the engine is exhausting, the whole atmosphere.

Q. In other words, the carbon monoxide, whether it comes out the end of the tail pipe with the Vacudex or without, is immediately diluted by the whole atmosphere it comes out into?—A. That is correct.

Q. And it is your statement any attempt to dilute it before it gets to the end of the pipe would have no appreciable effect; is that correct?—A. That is correct.

Q. Does this device or could this device cause a motor to run smoother or quieter?—A. It could not.

Q. Does it or could it improve the pick-up or flexibility of a motor?—A. It could not.

Q. Does it or could it in any way affect a saving in tires?—A. I do not see how it could. I do not see any reason why it should or should be claimed.

Q. The respondent stated this morning that that claim was based on smoother operation of the engine which in turn was due, according to his contention, to the suction which eliminated back pressure. Under that theory it certainly could not, could it?—A. Not if it has no effect on the back pressure; no.

Q. Now, Mr. Bruce, after a motor has become old or been used a considerable time, does it have less power than it had when it was new?—A. Slightly.

Q. Now, in a case of an old motor not performing as well as it did when it was new, is there any possibility of respondents' device effecting any of the benefits claimed which we have been discussing?—A. There is not.

Q. Now, in some of respondents' advertising the statement is made "Most cars are improved immediately; some require a little time. The percentage of gain depends upon the condition of the car." Now, your tests did not cover a very long period of time with Vacudex, did they?—A. They did not.

Q. Could it be possible had you tested the product longer you might have found the benefits claimed by respondents?—A. If any device would lower the back pressure of the exhaust gases due to the action of the air going through it, it would immediately show up on the manometer, showing a reduction in exhaust manifold pressure. If you did get a reduction in exhaust manifold pressure there is the possibility that in time you might in some way affect the operation of the engine, but as you did not get any reduction, there is absolutely no way it could affect the engine in any way, shape, or form.

Q. Does the muffler of a car that has been in use for some time ever become partially clogged and thereby reduce the power and efficiency of the engine?—A. Yes, sir.

Q. Is it possible, in that instance, for the respondents' product over a period of time to unclog or open up the muffler and bring the efficiency of the engine back up to what it was originally?—A. If it did not affect the pressure it could not do anything to the muffler or what was in it, whether gases, carbon, of whatever else it might have been.

Q. I notice in this test you made with the Vacudex the exhaust pressure was measured in milliliters of water, and in the other test which you described, which is in Commission's Exhibit 12, the exhaust pressure was measured in milliliters of mercury; would this have any bearing on the validity of the Vacudex test?—A. It would not. The only difference between our mercury test and our water test is that mercury is 13 times heavier than water and as we were going to go into large ranges of pressure, we had to use a device which would read larger pressures, and since a milliliter of mercury would be 13 times a milliliter of water, it would bring the graph to about where you are sitting, had we used water on this curve.

Q. The sheet in order to show the curve would be up to about here [indicating]?—A. Up to where you are if we had used the same scale. Otherwise there is no difference whether you use one or the other, except the water is more accurate for low pressures.

Mr. CALLAWAY. I belive that is all, Mr. Examiner.

Trial Examiner DUVALL. I would like to ask one question before the cross-examination begins.

Mr. Bruce, in looking at Commission's 12, the terminance of this upper line and of the lower line, will you translate exactly what that means there?

The WITNESS. That is merely how far we went in speed. We went to 60 miles an hour.

Trial Examiner DUVALL. You are talking about the upper line?

The WITNESS. Both of these.

Trial Examiner DUVALL. Explain what the circles mean.

The WITNESS. The lower curve, the circles are the pressures we read in the exhaust pipe at these various engine speeds that correspond to car speeds. This is roughly 1,000 revolutions a minute [indicating], and this is 1,500 and this is 2,000.

Trial Examiner DUVALL. You say this; I want it in the record; I want you to explain what this is.

The WITNESS. This point is the pressure in the exhaust manifold.

Trial Examiner DUVALL. What point?

The WITNESS. The circle or X.

Trial Examiner DUVALL. The one marked "20"?

The WITNESS. Yes; at 20 miles an hour.

Trial Examiner DUVALL. That is what I want you to say.

The WITNESS. The two points are identical, the X and the circle, and at 20 miles an hour there was almost no pressure at all in the exhaust pipe. At 30 miles an hour the pressure in the exhaust pipe was 10 millimeters of mercury, at 60 miles an hour the pressure was 75½ millimeters of mercury. In other words, the pressure in the exhaust pipe increases as you increase the speed of the engine.

Trial Examiner DUVALL. Now, explain the upper line.

The WITNESS. The upper line is the reduction in pressure in the exhaust pipe to effect a one-mile per gallon increase in economy—increase in mileage. So that to increase the miles per gallon one mile per gallon at 20 miles an hour you would have to decrease the pressure in the exhaust manifold by 450 millimeters of mercury. To get a one-mile improvement at 30 miles an hour you would have to decrease the pressure practically 300 millimeters of mercury, and at 40 miles an hour, also 300 millimeters of mercury, and at 50 miles an hour you would have to decrease it almost 400 millimeters of mercury, and at 60 miles an hour, 350 millimeters of mercury.

Trial Examiner DUVALL. Why is that difference between 50 and 60 miles an hour?

The WITNESS. That is because the road load economy curves are not parallel; they overlap each other. The carburetors do not give you a constant mixture ratio at various speeds, but you can see they are all in the neighborhood of the same thing, between 300 and 400 millimeters of mercury, and that is the range, the area of the metering characteristics of the carbon on the oxygen.

Trial Examiner DUVALL. All right.

By Mr. CALLAWAY:

Q. When you say so many millimeters of mercury, you have reference to your manometer which you were using?—A. Yes, sir. Would you like me to translate that into pounds per square inch?

Q. If you please.—A. 760 millimeters of mercury is equivalent to an atmospheric pressure of 15 pounds per square inch. So this is about one-half. So it takes half an atmosphere reduction in pressure to give you one mile per gallon improvement.

Q. It takes half an atmosphere pressure?—A. In other words, you would have to reduce the pressure, which is 15 pounds per square inch, the pressure in which we live—you would have to reduce that to 15 pounds per square inch at the end of the tail pipe in order to get one mile per gallon improvement in economy.

Q. How much pressure was it necessary to force through the tail pipe to get this one mile per gallon—excuse. What I wanted to ask you, in making these tests you changed the back pressure or the exhaust pressure by means of an auxiliary engine, did you not?—A. We had a 300-horsepower Nash blower sucking the air out of this thing to get these reductions in pressure.

Q. I see. How many horsepower are necessary to effect the changes in pressure at each stage?—A. Of course, what we did was just to throttle this big blower to get this reduction, but my guess is that if we had a 4-horsepower blower we could have removed the gas and reduced this pressure.

Q. It would take about a 4-horsepower blower?—A. Yes.

Q. And yet the reduction in pressure which you found by use of the Vacudex was absolutely negative; there was no change in pressure except that found in the Dodge, which you say was insignificant?—A. It was in the wrong direction.

Q. Yes. So this test, as demonstrated by Commission's Exhibit No. 12, although it was not on a Vacudex or with a Vacudex, it demonstrates, does it not, that the amount of power required to change the exhaust pressure is so large that there could not have been any possibility of your making a sufficient error in the Vacudex test to affect the result?—A. That is correct.

Q. Now, you talked about exhaust pressure and back pressure; are they synonymous terms?—A. Yes, sir (Tr. 79, line 20 to line 2, p. 93).

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Q. These tests referred to were made way back of that time, were they not?—A. In July 1942.

Q. On whose request did you make that test?—A. The Petroleum Coordinator for War. (Tr. 97, line 4 to line 8.)

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Q. Explain in detail how you attached the Vacudex to the exhaust pipe.—A. You had better ask Mr. Streets that question.

Q. You did not attach it?—A. I did not.

Q. And you do not know how it was attached?—A. It was attached as per instructions that we got in the literature we received with the device.

Q. Do you know the instructions were followed?—A. Yes.

Q. Although you did not attach it?—A. I did not.

Q. Were you present when it was attached?—A. No.

Q. You were not?—A. No.

Q. How do you know how it was attached?—A. I did not say I did not know, except they were instructed to attach it in accordance with the instructions which they sent with the device.

Q. But you were not present and did not supervise the attaching of the Vacudex to the Ford car?

Trial Examiner DUVALL. He said that several times, Mr. Hall.

By Mr. HALL:

Q. Did you ever offer to furnish to Mr. Decker or Mr. Blair the results of your tests?—A. Not that I know of, sir.

Q. You knew this Vacudex was an invention that had been patented, did you not?—A. No (Tr. 107, line 15 to line 20, p. 108).

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Q. Now, the tester that you claim you used on the Ford car, where did you attach the different connections; what parts of the car did you attach the different connections?—A. The water manometer was attached into the exhaust manifold near the outlet to the exhaust pipe. The instrument that measured the fuel consumption was attached to the carburetor.

Q. It was not attached in the exhaust pipe, was it?—A. In the exhaust manifold.

Q. But not in the exhaust pipe?—A. The exhaust manifold bolts onto the exhaust pipe and it is probably an inch away from it.

Q. But it was not attached to the exhaust pipe?—A. The exhaust manifold is part of the exhaust pipe, so it was attached to the exhaust pipe.

Q. I mean the testing apparatus.—A. The water manometer was attached to the exhaust manifold so that it rid exhaust pipe pressure.

Q. Where you attached it it would register the exhaust pipe pressure just as well as if it had been attached in the pipe?—A. Or anywhere along the line it would read the same thing.

Q. But it was not attached in the pipe?—A. No; it was tapped into the exhaust manifold.

Q. Now, what happens to an automobile engine if you stop up the exhaust pipe?—A. It would increase the back pressure.

Q. Would anything happen to the engine?—A. It would decrease the power in proportion to the increase in back pressure.

Q. Suppose secretions from the exhaust—from the engine—form in the exhaust pipe and in the muffler, what effect does that have on the operation of the engine?—A. It would tend to increase back pressure.

Q. Any apparatus that would keep the muffler cleaned out and keep the exhaust pipe cleaned out would help reduce back pressure, would it not?—A. That is correct.

Q. I notice in your report you use the words "no significant change or difference in the consumption of gasoline"; what do you mean by the word "significant"?—A. Any road tests are affected by road wind. Of course, there was no traffic on this road we were on, but in most cases they are affected by traffic, temperature of the differential, temperature of the transmission and all of the bearings, tire pressure, tire loading, crosswind, whether it was crossed directly or in front or behind, barometric changes and humidity changes; all of those things would affect road tests and give you a variation in any road test you could make. By significant I mean the differences were inside of the range of differences accountable for these variations.

Q. A great deal would depend in your tests on just how they were attached to the instrument you were going to test, would it not?—A. I do not understand the question.

Q. A tester of an instrument like Vacudex could attach it so that it would not show any effect at all. I mean you would have to attach it in a certain way to get the results you were trying to find out about the instrument.—A. You would have to put it on the tail pipe, and if it created a reduction of pressure at the end of the tail pipe it would create it all along the line up to the engine.

Q. I say it would have to be attached in the correct manner in order to get a fair test of it; is that right?—A. It slides on the end of the tail pipe with a clamp on it to hold it on.

Q. I am talking about the testing apparatus. The testing apparatus could be attached in a way it would not show any results at all?—A. No. It would not be a test if it did not show anything.

Q. It could be attached to the instrument being tested so that you did not get any results?—A. We did not attach anything to the instrument.

Q. It has to be correctly attached to the device you are testing?—A. The testing appartus?

Q. Yes.—A. Yes.

Q. If you do not attach it correctly, you would not get results?—A. We did not get any when we did attach it correctly.

Q. Where it does not show any results, that could come from the lack of proper attachment of the testing apparatus to the engine or to the Vacudex or to the exhaust pipe, or whatever you are testing?—A. If you put a connection into the exhaust manifold and connect it to a water manometer, it reads the pressure, and the pressure goes up as the engine speed goes up without the device, then you do not attach the testing apparatus; you install the device and duplicate those runs, and if there is a difference caused by that device it will be read on the manometer.

Q. As a mechanical engineer do you know the principle or theory on which they operate the Holland Tunnel in New York City?—A. I was in on the consultations on the installation of the blower.

Q. They have a method there of reducing monoxide gas in the tunnel, do they not?—A. Yes.

Q. Tell the Examiner how they do that?—A. They have thousands of horsepower motors running blowers that pump the air out of the tunnel.

Q. Do you know what percentage they start the blowers to work?—A. About one.

Q. About one percent?—A. Yes.

Q. They start up automatically?—A. Yes.

Q. That is to mix the monoxide gas with the air?—A. They pump the tunnel out and the cool air comes in the ends.

Q. Would not the same thing be true of an exhaust pipe in an automobile where you inject air into the gases formed in the exhaust pipe?—A. Certainly you can inject air into the exhaust pipe, which would probably increase back pressure due to the fact you made the pipe conduct more air out.

Q. You think, then, a reduction of the monoxide gas by introduction of air into the exhaust pipe would create more pressure?—A. Yes.

Q. Do you know that to be a fact?—A. Absolutely; yes.

Q. Suppose the device is larger in diameter than ordinary exhaust pipe or that the induction ducts that take the air in are larger?—A. If you had the area increased in exact proportion to the amount of air you added, then, of course, the pressure would be the same.

Q. Did you ever text Vacudex attached to an exhaust pipe by the smoke test?—A. Yes; I believe we did blow some smoke in, and the smoke, of course, goes into the Vacudex device.

Q. What did that demonstrate?—A. That there was air going into the device.

Q. What else?—A. That is all.

Q. Did it create any vacuum in there?—A. There was a difference of pressure enough to cause that flow of air or otherwise smoke would not have gone in.

Q. Then, that proved to you that there was a decrease in pressure?—A. That is from one end of the funnel to the other.

Q. It proved that by the smoke test?—A. The smoke goes through it, but that had nothing to do——

Q. Did any——

Mr. CALLAWAY. Let him finish.

The WITNESS. But that had nothing to do with the pressure on the exhaust, of course.

By Mr. HALL:

Q. You say you made a road test of Vacudex; how long was the road test in length?—A. We ran back and forth over a mile of level concrete road; a measured mile.

Q. You went once with the Vacudex attached and another time without it?—A. We made three or four trips at each speed without the device and then we ran with the device on three or four times in each direction.

Q. And your report on that test is it made no significant change in the operation of the car?—A. That is correct.

Q. What do you mean by significant?—A. That there is no change beyond the experimental area of the test.

Q. There might have been some change, then?—A. We showed the pressure was greater with the device than without it on a Dodge truck.

Q. That is your report?—A. Yes.

Q. Did you find any back pressure in the manifold when you were making this test?—A. Yes, sir. Figure 1, which is Exhibit 11–C, shows that the back pressure in the manifold went up from 50 millilitres of water at 20 miles an hour to 450 millilitres of water at 50 miles an hour.

Q. Now, I want to know this: is there any difference in the back pressure in a manifold with reference to the muffler and with reference to the exhaust pipe; is the back pressure in each one of those places the same; are they all the same throughout?—A. The difference in back pressure measured at the exhaust manifold represents the amount of friction necessary to shove the gas the rest of the way. In other words, it is limited by the amount of friction in the pipe, which is very small, and for all intents and purposes the pressure is the same as at the muffiler as at the exhaust manifold.

Q. It is the same all of the way through the manifold, muffler, and exhaust pipe?—A. That is correct.

Q. Or after the muffler?—A. After the muffler it is the atmospheric pressure.

Q. And no back pressure?—A. No.

Q. Would back pressure have any effect on the atmospheric pressure?—A. No, sir.

Q. Not a bit?—A. No, sir.

Q. I believe you testified with reference to the gases in the exhaust line and said the temperature was the same throughout the gas exhaust line—I mean the temperature of the gases.—A. No; the temperature of the gases in the exhaust manifold would be about 1,500 degrees Fahrenheit, and depending upon the cooling you have from there to the tail pipe would depend how far it would drop.

Q. If you injected fresh air into the exhaust pipe it would reduce the temperature of the gases?—A. It would help reduce the temperature.

Q. It would help reduce the temperature?—A. Yes.

Q. If the exhaust pipe is cool the gases pass through the pipe faster or slower than they would if it was hot?—A. The temperature of the gases has nothing to do with the flow with the exception that, of course, they would have a larger volume if they were hotter so there would be more resistance.

Q. Then, the temperature of the gases would not have any effect no matter what condition the exhaust pipe was in whether it was cold, warm or hot?—A. If you had a refrigerated exhaust pipe you would certainly cool the exhaust gases down more than you would if you had a hot one.

Q. Mr. Bruce, I hand you a magazine here which was probably gotten out by the Venturi tube—no; it is the Mormount muffler. It explains the lowering of back pressure and shows a graph explaining it. I wish you would look at that and tell us what you think about it.—A. He shows a graph showing curve A as the line showing back pressure present in exhaust pipe if you do not have any muffler, and line B shows the back pressure in exhaust pipe if you have a Mormount muffler, and lines C, D, and E show back pressure present when three different manufacturers' mufflers are used, coded as C, D, and E. He shows here, for instance, if you wanted to compare these at 2,000 revolutions per minute, which is about 40 miles an hour, the back pressure is about one pound with no muffier, one and one-half pounds with the Mormount muffier, and with muffler C it is 1.75, with muffler D, 2.5, and with muffler E, 3.25 pounds.

Q. That shows there was a decrease in back pressure, does it not?—A. That shows that if you change the restriction in the end of the pipe there is a difference in the pressure which corresponds exactly with what we did by closing the valve in the exhaust pipe and changing the pressure.

Q. Will you look further and see where it shows a decrease in back pressure of about 7 pounds?—A. What is that? The end of the curve—of the graph is 7 pounds, but nothing has reduced it to that.

Q. I mean these lines [indicating].—A. That means that at 2,400 R. P. M. you have 7 pounds back pressure and as you slow the engine down the back pressure decreases until you get down to 1,000 revolutions a minute, when it is changed from 7 pounds to 1.3 pounds.

Q. The back pressure, then, is increased up to 7 pounds, and when you operate the car at 2,400 revolutions a minute?—A. That is right (Tr. 109, line 5 to line 17 p. 119).

* * * * *

Q. Then, Mr. Bruce, you do not have a—you do not think a road test is very reliable in testing the results of Vacudex?—A. I do not.

Q. You do think that the use of the dynamometer is the test that should be made?—A. Yes, sir (Tr. 120, line 19 to line 25).

* * * * *

TESTIMONY OF RONALD E. STREETS

Q. Mr. Streets, where do you live?—A. At 1765 Massachusetts Avenue, Washington, D. C.

Q. Where are you employed?—A. The National Bureau of Standards.

Q. How long have you been employed there?—A. For about 4½ years.

Q. In what branch or department of the Bureau of Standards do you work?—A. In the Automotive Section of the Heat and Power Division.

Q. Have you been employed in that section ever since you have been at the Bureau of Standards?—A. Yes, sir.

Q. What educational qualifications do you have, Mr. Streets?—A. Well, I have four years at the College of Idaho, majoring in chemistry. Then I have been taking engineering since I got here, at George Washington University.

Q. You do not have a degree in engineering?—A. No.

Q. In the work that you have done out there at the Bureau of Standards, have you been making various tests of automotive equipment?—A. Yes.

Q. Is that part of your regular duties out there?—A. That is the whole duty.

Q. Now, are you familiar with the way a manometer works?—A. Yes.

Q. Have you used that instrument at various times in your work out there?—A. That is right.

Q. What is the purpose of a manometer?—A. To measure pressure or pressure difference.

Q. Are you familiar with the volumetric measuring device that they use out there at the Bureau of Standards?—A. Yes.

Q. What is the purpose of that?—A. To measure the amount of fuel or whatever liquid used being consumed at a given rate of time volumetrically.

Q. Is that device more accurate than just measuring in a gas tank?—A. Yes; the device is quite accurate in that it enables you to measure within half a milliliter, which is a fairly fine division; it amounts to about 0.008 of a gallon.

Q. Mr. Streets, Mr. Bruce yesterday testified that you made a test of a device called Vacudex under his direction at the Bureau of Standards; is that correct?—A. That is right.

Q. I hand you Commission's Exhibit 11–A to 11–D, which I wish you would look at and see if that is a correct report of the tests that you made under Mr. Bruce's supervision?—A. That is correct; this is the complete report.

Q. This Vacudex test, I believe you made in 1942, was it not?—A. Yes.

Q. There is present in the hearing room this morning a Vacudex, which has not yet been offered in evidence. I show you that and ask you is that similar to the instrument you made the tests with?—A. It is similar. I do not think it is identical, however.

Q. I show you Commission's Exhibit No. 9, which shows a picture of the Vacudex attached to the tail pipe on a gasoline engine and ask you if that picture illustrates the manner in which you attached the Vacudex to the engines on which you made these tests?—A. That is correct. I believe this more nearly represents the Vacudex we had for the samples we tested. There have been a few mechanical changes made in that one.

Q. You attached your water manometer to measure the pressure, or reduction in pressure, if any, that was to be created by the Vacudex?—A. Yes.

Q. Where did you attach that, Mr. Streets?—A. On the exhaust manifold.

Q. Now, just tell us what you did, the way you made the test?—A. Well, the tests were made——

Q. You can refer to the report if you want to refresh your memory.—A. The tests were made on one 1941 Ford four-door sedan, and also on a Dodge ¾-ton pick-up——

Q. Let me ask you this: Did you inspect the tail pipe before you attached the Vacudex?—A. On both cars we inspected the whole exhaust assembly from manifold to tail pipe to be sure there were not any existing leakages around gaskets, fittings, and so forth.

Q. Just go on from there.—A. Each car was run on a measured mile on our test strip on Mount Vernon Highway, both with and without the Vacudex, on the same test for each respective vehicle, by first making the runs—I do not remember whether it was with or without, but that does not matter—but the runs were made to determine the pressure by manometer on the manifold at each of several speeds, from 20 to 50 miles, in ten-mile jumps, and sufficient runs were made to provide check runs in both directions, north and south. In other words, if there were any difference due to prevailing winds, they should average the same, check runs being considered those in which you have volumetric fuel measurements that check within probably from 5 to 10 milliliters. In fact, I think they check closer than that, but inasmuch as that is on the order of less than 0.001 of a gallon, it is a reasonably close check.

Q. All right.—A. Following the test without the Vacudex attachment, the car was taken and no changes were made other than the Vaudex was fastened as directed in the directions that came with each model, to the tail pipe of the test car, and the same runs were repeated, taking the volumetric fuel measurement and exhaust pressure at the manifold under the same conditions of speed.

Q. On the Dodge pick-up, I believe you found a little increase in back pressure with the Vaudex attached, did you?—A. The curves we have here show a small increase, but the increase, you have to realize, is very small, on the order of 10 milliliters of water in the manometer, which is well within the range of experimental error and is hardly measurable pressure.

Q. You found on the Ford it made no difference at all?—A. That is true. On the Ford it shows the curves are almost identical. There is a slight scatter in the points, but it is just an experimental error. You cannot get any closer than that.

Q. That report was made as a result of the tests you made?—A. That is correct.

Q. And that report is a correct statement of the procedure followed in the tests?—A. That is correct.

Q. And a correct statement of the results of the tests you made under Mr. Bruce's direction?—A. Yes (Tr. 125, line 18, to line 22, p. 130).

* * * * *

Q. Mr. Bruce stated yesterday that the road test was not a satisfactory test; do you agree with that?—A. It is not nearly as accurate as a controlled laboratory test (Tr. 131, line 1 to 4).

* * * * *

By Mr. HALL:

Q. Who instructed you to participate in the test of the Vacudex?—A. Mr. Bruce.

Q. Mr. Bruce?—A. Yes.

Q. Did anyone ever say anything about the tests to you?—A. Certainly. We always discuss all tests with the supervisor before they are made.

Q. There was some difference of opinion about this among you fellows out there, was there not?—A. How do you mean, difference of opinion?

Q. Whether or not the test was properly made or not?—A. At the time, I believe it was stated that to make an adequate test it would be necessary to spend considerably more time and use more elaborate equipment, and we were quite busy with war work, and it was admitted that it was not as comprehensive a test as it could be.

Q. The one you have made here?—A. Yes.

Q. This report is based on the fact it was not as comprehensive a test as it should be?—A. It was as comprehensive as could be made on the road, but road tests are not as good as taboratory tests as far as accuracy is concerned.

Q. Laboratory tests were not considered as comprehensive as they should be?—A. We made none of this; we made no laboratory tests of this.

Q. You made no laboratory tests?—A. No.

Q. Only a road test?—A. That is all.

Q. And this report is only on this road test and on no laboratory test?—A. That is right.

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Q. Mr. Bruce did not make a laboratory test?—A. No.

Q. He did not use any kind of apparatus that you have out there to test the Vacudex attached to an automobile?—A. Do you mean in the laboratory?

Q. Yes.—A. No.

Q. So this report is based altogether upon the road test made?—A. That is correct.

Q. Now, who was present with you besides Mr. Bruce when the test was made?—A. On one car, the Ford, it was Donald B. Brooks, section chief of the Automotive Section.

Q. Was Mr. Bruce present when the test was made on Mount Vernon Boulevard?—A. No; only when the equipment was assembled.

Q. Then he would not know about what occurred at the actual test, would he?—A. Yes; but he did not ride in the test car.

Q. He was not down there even, was he?—A. No.

Q. Where was he while these tests were being made?—A. At the Bureau of Standards.

Q. He did not go with you to supervise the test or to direct you about it, or anything of that kind?—A. He directed us on the test fully before we left the Bureau.

Q. But he was not present at any time while the test was being made?—A. That is right.

Q. Who was present with you, did you say?—A. Donald B. Brooks.

Q. Now, before the test was made, please describe exactly what inspection and examination was made of the manifold, the muffler, and the exhaust pipe on which the Vacudex was attached?—A. Well, the manifold bolts and gaskets were checked.

Q. What did you do?—A. In most cases——

Q. I am asking you about this case.—A. If you will wait a moment, I will tell you. In most cases you will find a certain amount of looseness around the manifold fittings due to lack of proper tightening, and that is evidenced by exhaust leakage. So we tightened all of the bolts and inspected the gaskets to be sure none were blown and that there were no holes in the sides of the gaskets. The same thing was done at the junction of the manifold, at the manifold flange and the exhaust flange. There is a gasket there which could possibly cause leakage, and that was checked and tightened down. Then the exhaust tail pipe was examined from there on up to be sure there was not any hole or leakage at the fitting where it is fastened to the muffler.

Q. Did you examine the muffler?—A. The muffler itself.

Q. And you examined the tail pipe also?—A. Both sides.

Q. In what position was the car when you made this examination of the manifold muffler and tail pipe?—A. On all four wheels. What do you mean, what position?

Q. Was it over a pit or raised in the air; how did you get under it?—A. By means of standard garage rollers.

Q. You were lying flat on your back, and in that position you could not see anything on top at all, the muffler or exhaust pipe or manifold, could you?—A. In that position it is possible to inspect practically all sides. You can get your head up and inspect all sides of the muffler and tail pipe fittings.

Q. Did you do that here?—A. Yes. In the Ford you can look on top of the muffler quite well from that position.

Q. You did not raise the car over a pit or into the air in any way, so you would have the advantage of looking at it in that way?—A. It would not give you any advantage.

Q. Did you make any test outside of checking these different elements to determine whether there was any leakage or not?—A. After tightening down, the system was checked while it was running by trying to detect the slightest leakage by hand.

Q. Who did the checking?—A. I did.

Q. Mr. Bruce did not have anything to do with it?—A. He looked it over after I had tightened it down and said it was satisfactory.

Q. He then went away?—A. I ran the engine and Bruce went around to see if he could detect any remaining leakage that might have existed. He examined it and announced it to be satisfactory.

Q. Now, Mr. Streets, I hand you Commisison's Exhibit No. 9, which is a photograph of the manifold, muffler, and exhaust pipe, with the Vacudex attached. Where did you attach your testing machine to that figure?—A. On the Ford—I might say this picture here is of a six-cylinder manifold——

Q. Will you please mark the manifold in red, "figure No. 1?"

Mr. Calloway. I do not think there is any necessity for marking that exhibit up. He can point to the place and make his descriptions in that way.

The Witness. This is a six-cylinder manifold and is not the same as the manifold on the Ford which we tested.

Mr. Hall. Your Honor, we offer a similar photograph of what I am asking the witness about, which is Exhibit No. 9, and ask that he offer it as an exhibit to this testimony as No. 9–A.

Trial Examiner Duvall. You do not want to offer that as Exhibit 9–A.

By Mr. Hall:

Q. Will you mark in red pencil where the manifold is?—A. This [indicating] is it.

Q. Will you mark "manifold" somewhere around there?—A. Yes.

Q. Will you mark or check the exhaust pipe?—A. This [indicating] is the exhaust pipe. That is already marked.

Q. All right. Where is the muffler?—A. Right here [indicating].

Q. Mark that, please.—A. It is marked.

Q. What is this out here between the muffler and the Vacudex?—A. That is commonly called a tail pipe.

Q. And what is this on the end?—A. That is the Vacudex.

Q. The Vacudex?—A. Yes.

Q. Where did you attach your testing manometer?—A. The manometer was attached to the manifold at this point [indicating]. As I said before, this is not a Ford manifold. All of the ducts come together in one spot at the front. It was drilled and tapped right here [indicating].

Q. Will you please put an arrow there?—A. At approximately this [indicating] location.

Q. Where you make a round mark on the manifold?—A. Yes. That is the manometer tap.

Q. Was it attached to any other point on the manifold, exhaust pipe, muffler, or any other part?—A. The manometer?

Q. Yes.—A. No; it was placed in one spot on the manifold and remained there throughout the test.

Q. All pressure tests were taken from that one location on the manifold?—A. That is correct.

Q. You did not try it at any other portion of the manifold, exhaust pipe, muffler, or anything else?—A. There is no reason why you should.

Q. Well, I am just asking you. The reason for that is because the pressure does not show up at any other point?—A. No; you get some pressure any place along this line. It starts with the maximum pressure in the manifold and gradually decreases down to atmospheric. Obviously, anything that will affect an engine in any way will decrease the pressure in the manifold because that is where the back pressure is exerted upon the piston.

Q. Now, at which point is the back pressure greatest, the manifold, exhaust pipe, or muffler, if there is any difference?—A. In the manifold.

Q. It is always greatest in the manifold?—A. That is where it is created.

Q. How much greater than in the muffier?—A. It would be as much greater as it has to be to get the pressure drop through here [indicating], due to the friction in the pipe flow. You start out with pressure in the manifold and it takes friction to force it through the pipe, and the friction loss is shown by slight pressure loss.

Q. As it passes on through the muffier, it becomes less?—A. That is correct.

Q. Then the muffler does not increase the back pressure; it would not increase the back pressure?—A. Over what?

Q. Over the manifold.—A. The muffler would increase the back pressure from what you would have if you had no muffler and tail pipe at all.

Q. The muffler attached would increase back pressure?—A. Obviously, all of those things are increasing resistance to flow all of the way out (Tr. 134, line 1 to line 15, p. 142).

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By Mr. Hall:

Q. Mr. Streets, suppose this aluminum pipe here represents a tail pipe or exhaust pipe—you have seen this model of Vacudex, have you not?—A. It is not the same as the one we tested.

Q. It is similar?—A. Yes; it looks similar.

Q. Will you describe and demonstrate how you attached the Vacudex to this pipe in your test you just testified about?—A. This particular Vacudex is not the same as the one we had. As I recall——

Mr. CALLOWAY. Do you mean the method of attachment?

The WITNESS. It is not manufactured the same. The end that fastens to the tail pipe, the sheet metal treatment is not identical, if I am not mistaken.

By Mr. HALL:

Q. The form of the object is the same?—A. Yes.

Q. The form and shape are the same as the one you tested?—A. Yes; it is very similar.

Q. The only difference that you remark about is that the metal has not been treated the same?—A. The fitting is not quite the same.

Q. Describe the difference.—A. As I recall, this was not ferrated all of the way around, and the part that went onto the tail pipe was split in one or two spots in order to allow flexibility.

Q. Is this also split to allow flexibility?—A. Yes.

Q. The same as the other?—A. Yes.

Q. Demonstrate how you attached the Vacudex to the exhaust pipe or tail pipe.—A. Well, the assembly, as it came for the particular vehicle it was to fit, had enclosed with it a set of directions on how to place the Vacudex on the tail pipe.

Q. Where are those directions?—A. I do not have a copy of them.

Q. You do not know what became of them?—A. I think they were sent back with the sample which you requested to be returned.

Q. Are you sure?—A. I think the sample was sent back.

Q. Are you sure the instructions were sent back?

Mr. CALLOWAY. It is not important whether they were or not.

Mr. HALL. It is.

The WITNESS. At least, we do not have them.

By Mr. Hall:

Q. Well, show us how you attached the Vacudex to the exhaust pipe, this aluminum pipe representing the exhaust pipe.—A. The fitting was put on and the end was cleaned off——

Q. Now, the aluminum pipe which you have in your hand, what does that represent?—A. The end of the tail pipe.

Q. Or the exhaust line from the engine of an automobile?—A. From the muffler to the rear of the car.

Q. And you have that in your right hand as you testify?—A. Yes (Tr. 143, line 8 to line 17 p. 145).

* * * * *

By Mr. Hall:

Q. The enamel piece of pipe represents the tail pipe of an automobile?—A. Yes.

Q. Now, the other article that you hold in your hand is what you would call a Vacudex, and that is in your left hand?—A. That is correct.

Q. And it has a mark on there—will you read this?—A. It is marked here "Vacudex, 1½ by ½, Model A, tested 2/27/45, tester No. 42, Decker Products." There is a signature there that I cannot read.

Q. Please demonstrate just exactly how you attached the Vacudex to the tail pipe.—A. The clamping screw on the Vacudex was loosened sufficiently to allow the Vacudex to be forced onto the end of the tail pipe——

Q. Just do that, please.—A. I will not need to unscrew it at this point. It was placed on the tail pipe, and as I recall the directions specified which side of the Vacudex should be——

Q. Which side was that?—A. I remember those were the directions, that that was the way it was to be placed on.

Q. Will you demonstrate how one side was to be up?—A. It either had an arrow specifying, and it specified the clamping screw should be either up or down.

Q. Will you demonstrate that?—A. I do not know which it was, but that was what the directions said.

Q. You followed the directions, no matter what it was?—A. That is correct; as we always do in making any test.

Q. How far did you shove the Vacudex onto the exhaust pipe or the tail pipe?—A. For each one tested, I believe it specified the distance, but I do not remember just what it was.

Q. How far was that?

Mr. CALLAWAY. He said he did not remember.

Mr. HALL. If you are going to testify——

The WITNESS. If the directions said 2 inches, it was 2 inches.

By Mr. HALL:

Q. So, on this exhaust pipe here, how far would that be?—A. It would be approximately—let us say 3 inches—it would be to about that point [indicating].

Q. That demonstrates how far you pressed the Vacudex onto the exhaust pipe?—A. I do not say this is the same, but if your directions stated 3 inches, that is the distance we placed it on. I think you did specify how far each model should be placed on the pipe.

Q. How far do you want this to represent?—A. You brought this thing in; what do you want it to represent?

Q. Is that the identical way you placed the Vacudex on the exhaust pipe of the automobile you tested?—A. This is similar.

Q. Just like that—how many inches have you covered here with the Vacudex onto the exhaust pipe?—A. Three inches, approximately.

Q. Will you mark where the pipe extends?—A. It is approximately 3 inches; right there [indicating].

Q. Where I make the red mark; is that right?—A. Yes (Tr. 146, line 7 to line 20, p. 148).

* * * * *

Q. Now, where you have made the red mark on here is the extent to which you fitted the Vacudex onto the exhaust pipe?—A. On this one. I will say it was the one I tested.

Q. You said it was similar.—A. Yes; but I would need a measuring instrument to tell you exactly.

Q. Will you mark on the exhaust pipe here where it extends to, in red?

Trial Examiner DUVALL. Before we go any further—off the record.

(Discussion off the record.)

By Mr. Hall:

Q. Now, your problem was to get this Vacudex clamped and fastened on here as tight as possible?—A. That is true.

Q. So you shoved the exhaust pipe up 3 inches or more and then clamped it as tight as you could?—A. We placed it at the correct distance as specified in the directions and tightened it as tight as your clamping device provided.

Q. Did you push it on as far as you could?—A. By that do you mean we pushed it on until we hit some protrusions on the inside?

Q. Yes.—A. No; I don't believe so.

Q. Have you ever made one of these tests before?—A. You mean specifically what?

Q. On a Ford car, of the nature you are testifying about?

Trial Examiner Duvall. Test for what? You said "one of these kinds of tests"; be more specific.

By Mr. Hall:

Q. Did you ever make a test to determine the back pressure from an engine in a muffler exhaust pipe or tail pipe using a contrivance like the Vacudex before you made this test?—A. I do not think we tested any other before the Vacudex, that is, any other tail pipe attachment, but we have run tests to determine exhaust back pressure at various points, fuel flow and fuel consumption (Tr. 149, line 1 to line 14, p. 150).

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Q. Mr. Streets, at what speeds did you operate the Ford car in the road test you just testified about?—A. 20, 30, 40, and 50 miles an hour.

Q. How long was the course over which you traveled?—A. It was a measured mile. The interval during which measurements were made was a measured mile.

Q. You did not make any tests over any other course than that?—A. That is correct.

Q. How many times did you operate over the mile course without the Vacudex?

Mr. Callaway. Do you have any notes that would show you that?

Trial Examiner Duvall. You can refresh your recollection if you wish.

The WITNESS. At each speed, we made four runs.

By Mr. HALL:

Q. At each speed you made four runs?—A. Through a measured mile.

Q. Do you mean you made four runs at 20 miles and four runs at 30 miles, and four runs at 40 miles?—A. Yes; and four at 50 miles.

Q. That was going in each direction?—A. No; that is two in each direction.

Q. Two in each direction at 20 miles an hour and two in each direction at 30 miles an hour, and two in each direction at 40 miles an hour—and that was without the Vacudex?—A. You understand that is the minimum it takes to get check runs.

Q. Then you put the Vacudex on; is that correct?—A. That is correct.

Q. Then, how many runs over the course did you make with the Vacudex on?—A. We had the same conditions at 20 miles per hour, 30 miles per hour, 40 miles per hour, and 50 miles per hour, and the same number of runs were made.

Q. Was there any difference in the results in the various runs of 20 miles per hour, 30 miles per hour, 40 miles per hour, and 50 miles per hour operation?—A. You mean as between with and without the Vacudex?

Q. Yes.—A. The differences were only in the order of experimental error; they were so small they were not plotted.

Q. You do agree with Mr. Bruce the test is subject to error?—A. Every test is subject to error.

Q. That it does not exactly and truly at all times show the results of any device that is tested; is that right?—A. These were not tested at absolute values but comparative values. That is the important thing.

Q. You are likely to be in error in this test?—A. We probably have a 10 percent error.

Q. At least?

Mr. CALLAWAY. No; he means that is the maximum error.

The WITNESS. Yes.

By Mr. HALL:

Q. Did you make any tests to show that decrease or increase in consumption of gasoline in the operation was effected?—A. Yes. When the tests were made through the measured mile, the fuel flow was measured to determine the actual fuel consumption for the measured mile.

Q. What kind of apparatus did you use?—A. A volumetric flow device, which consists of a number of volumetric meters of different sizes so we can adjust the fuel flow rate on any particular car, depending on size of engine within about one-half millileter, which is—a millileter is approximately 1/3700 of a gallon—so that gives you a very fine division.

Q. Did you make other apparatus—did you use any other apparatus in making this test aside from what you have described?—A. We used a water manometer to measure pressure in the manifold, a U-tube manometer.

Q. That is all you used?—A. For back pressure measurement.

Q. You did not use any other apparatus of any kind?—A. So far as a testing instrument.

Q. That is subject to error, is it not?—A. The manometer?

Q. Yes.—A. It is capable of being read to one millimeter of water, which is a very small pressure difference.

Q. But there is some error?—A. It is accurate. It takes approximately 34 feet of water to equal atmospheric pressure, and hence one millimeter of water is an extremely small pressure difference.

Q. Did you ever testify as an expert or testify in any case before?—A. No, sir.

Q. This is the first time?—A. Yes.

Q. Did you exhaust the use of all testing apparatus required to show the exact results in the tests made?—A. Well, the only apparatus that is required is a device to measure fuel consumption and to indicate the exhaust back pressure or change of such, if any, and the feed, which, of course, is based upon the speedometer of the car being tested (Tr. 150, line 22 to line 19 p. 154).

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By Mr. Callaway:

Q. Mr. Streets, you were questioned on cross-examination about the place where you attached your manometer for measuring the back pressure. You had it attached on the manifold, which is at the opposite end of the tail pipe from the end at which the exhaust gases come forth; is that right?—A. It is at the engine, at least.

Q. What I am getting at is this: You attached your manometer at the opposite end of the exhaust system to which the Vacudex was attached?—A. That is true.

Q. Now, would a reduction in back pressure at the Vacudex end of the exhaust system be reflected in your manometer at the other end?—A. Yes. If you reduce the pressure at this end [indicating], the pressure will be reduced all of the way through the line and will show the resulting back pressure at the manifold.

Q. One more question. I believe you stated you had never made another test of a similar device to the Vacudex before you made the Vacudex test?—A. That is just from memory, but I do not believe so.

Q. Have you made various other tests of automotive equipment using the manometer and a volumetric fuel device?—A. I have tested a very large number of devices of various nature, fuel dopes and fuel additives.

Q. You had done that before this test?—A. Yes.

Trial Examiner DUVALL. You mean using the same instrument used to make these tests; is that true?

The WITNESS. That is true (Tr. 155, line 9 to line 14, p. 156).

TESTIMONY OF JESSE T. DUCK

Q. Mr. Duck, where do you live?—A. I live at 314 Emerson Street, Washington.

Q. Where are you employed?—A. At the Bureau of Standards.

Q. How long have you been employed there?—A. A little over eight years.

Q. In what department of the Bureau are you employed?—A. The Automotive Power Plant Section.

Q. Is that where various tests of automotive equipment are made?—A. That is right.

Q. How long have you been working in that department?—A. A little less than three years.

Q. Did you make certain tests under the direction of Mr. Clarence S. Bruce out there at the Bureau of Standards?—A. I have.

Mr. HALL. Are you going to offer him as an expert?

Mr. CALLAWAY. I am going to offer him to show that he did what Mr. Bruce told him.

Mr. HALL. Your Honor, we object——

Trial Examiner DUVALL. You do not have anything to object to yet. Go ahead with your examination.

By Mr. CALLAWAY:

Q. Now, what educational qualifications do you have, Mr. Duck?—A. I have a B. S. degree in chemistry and I have had a number of courses in physics and mathematics and I have had courses in automobile engineering. That is all graduate work which I took after I got through with my regular college work.

Trial Examiner DUVALL. Where did you get your degree?

The WITNESS. Union University, in Tennessee.

By Mr. CALLAWAY:

Q. Are you familiar with the use of a manometer as a testing device?—A. I have been using manometers ever since I have been working in the Bureau. The work is related to the extent—any scientist would know how to use the manometer, it seems to me.

Q. Are you familiar with the use of what is designated as a volumetric fuel-measuring device which is used out there at the Bureau?—A. I am. In fact, I built the one we used on these tests that I am to testify about.

Q. Now, did you make certain tests under the direction of Mr. Bruce out there at the Bureau of Standards for the purpose of discovering how much pressure change in the exhaust or back pressure would be needed for a one-mile per gallon increase in the gasoline mileage of a gasoline motor or engine?—A. I did.

Q. I hand you Commission's Exhibit No. 12 which has been introduced as an exhibit to Mr. Bruce's testimony and ask you if that chart was drawn as a result of the tests which you made and if it accurately represents what you found in those tests?—A. It does (Tr. 157, line 1 to line 6, p. 159).

* * * * *

Q. When did you make that test, Mr. Duck?—A. I believe it was about April 1945.

Q. Do you have a record of it there?—A. Yes; I have a record here.

Q. Look at the record and see when you made the test.—A The test report is dated March 9, 1945. Most of the work was done in February, I believe.

Q. It was made in 1945, though?—A. Yes (Tr. 159, line 25 to line 8 p. 160).

FURTHER TESTIMONY OF CLARENCE S. BRUCE

Q. You are the same Clarence S. Bruce who testified as a witness for the Commission in this case on June 6, are you not?—A. Yes, sir (Tr. 233 line 25 to line 3 p. 234).

* * * * *

Q. Mr. Bruce, there is in evidence, Respondent's Exhibit No. 4, which purports to be the report of tests of Vacudex by Frank D. Carvin. I believe I brought a copy of this report to you, up to the Bureau of Standards, several days ago, and asked that you study it. Have you done so, sir?—A. Yes, I did.

Q. Now, that report does not coincide with the tests that were made at the Bureau of Standards of the Vacudex, does it?—A. It fairly well agrees, except that there is an increase in power. There is also an increase in fuel economy as a result of the use of Vacudex; at least, it is claimed that there is.

Q. It differs from your report, in that regard, then?—A. Yes, sir.

Q. Now, will you take that report and criticise it as to inconsistencies which you found in it?—A. Yes, sir. There is one inconsistency that I think should be brought out and that is, that where the report claims that there was less gasoline used per horsepower. In other words, to get the specific fuel consumption, you divide the fuel consumption by the horsepower and you get the pounds by horsepower hour. Now, if you reverse that and divide back, you can obtain the number of pounds of fuel which he claims the engine used. In each case, he claims that the engine used less fuel when Vacudex was attached to the engine.

Q. Yes.—A. Now, if Vacudex removes the residual gases from the combustion chamber, as claimed, that would mean that the volume of constituents in the combustion chamber were less than when Vacudex was not used. Now, a carburetor delivers fuel in direct proportion to the amount of air that passes through it. Now, if there is less fuel or less residual charge in the combustion chamber when the intake stroke starts, then the air which will be necessary to fill the combustion chamber will be greater when Vacudex is used; and if the air supplied to the cylinder is greater, then the fuel supply must definitely be greater and not less, as shown in this report.

Q. In other words, as I take it from your statement, if the effect of the Vacudex was to lessen the back pressure, it would necessarily increase the amount of fuel used, is that correct?—A. That is right; it would increase the amount of fuel used and increase the horsepower, see. There would be a definite increase in horsepower but practically no increase in the specific, as the carburetor is set to deliver the amount of mixture, the same mixture ratio at various air flows in proportion to the air flow.

Q. Now, where do you find in Dr. Carvin's report there that the gasoline consumption is reduced with the Vacudex at the same time the horsepower is increased?—A. Now, he says—— (Tr. 234, line 13 to line 17, p. 236).

* * * * *

A. Well, if you read the report on Run 1 in Dr. Carvin's report, you will find the gasoline consumption in pounds per horsepower per hour. That consumption, with Vacudex on, is 1.014; with Vacudex off is 1.11, so that the pounds per hour with the Vacudex on is greater in that case. Now in Run 2——

By Mr. CALLAWAY:

Q. Wait just a minute. At the same time, on Run 1, does his report show that the exhaust pressure was reduced?—A. Let me see. The exhaust pressure before the muffler is less with Vacudex on than with Vacudex off; it shows he has a reduction in exhaust back pressure in that case.

Q. Now, then, according to——A. But he also shows that the horsepower is almost six-tenths of a horsepower greater.

Q. Yes.—A. Now, the figure which he gives, 1.014, is gotten from dividing the fuel consumption by the horsepower.

Q. Yes.—A. So that, if you reverse this procedure, with Vacudex on, you would get 7.81 pounds per hour.

Q. All right. What would you get with the Vacudex off?—A. With the Vacudex off, not used, 7.90 pounds per hour. In other words, there is nine-hundredths of a pound less gasoline.

Q. Yes.

Now——

Trial Examiner DUVALL. You mean, with the Vacudex on?

The WITNESS. With the Vacudex, he says that he used 9/100 of a pound less fuel.

Trial Examiner DUVALL. What do you say?

The WITNESS. Now, if with this reduction of pressure in the exhaust pipe they had more air and there would be less gases in the cylinder. Consequently, the air supplied by the carburetor must necessarily be greater without the device than with it. Now, if the air supply is greater, the fuel supply has got to be greater—and he says it is less.

By Mr. CALLAWAY:

Q. Now, these statements you have made are facts well-known by automotive engineers, are they?—A. Yes, sir. The air supply going through the carburetor has to be in proportion with the fuel flow. If you did not have it that way, you would not have any control over the mixture ratio whatsoever.

Q. So, Dr. Carvin's report in regard to Run 1, in those particulars that you have mentioned, then, is found to be incorrect, is it not?—A. It is inconsistent with the facts. Now, do you want to take up each of these runs?

Q. Yes; I believe I would.—A. Well, suppose we take Run 2. He says the horsepower with Vacudex is 22.3 horsepower; without Vacudex it was 21.6. He says that the gasoline consumption, pounds per horsepower per hour is 0.74 with the Vacudex; 0.77 without the Vacudex. Now, if you divide those, in the same way again, you would find that he would have to have a figure of 16.50 with the Vacudex; 15.50 pounds per hour without Vacudex. That should be with the Vacudex he would have 16.63 pounds per hour. This, again, is in the same direction; but this time if the exhaust back pressure before the muffler was only 1/10—is it pounds or inches of water? [After consulting papers.] Inches of water he has got in the first one. In other words——

Mr. Hall. What are you reading from now?

The Witness. Run 2. I am reading the exhaust pressure before the muffller, which is 16.6 with the Vacudex on and 16.7 with it off. Now, that is 1/10th of an inch of water, the amount which he says he got of reduction in pressure but still he says he gets more horsepower, practically—improvement in power. Then, again, he says that with the Vacudex on he used about 1/10th of a pound of fuel less. Now, if he did have this reduction in pressure and did have this advantage, he would use more fuel.

By Mr. Callaway:

Q. In accordance with the same statement you made about the report with regard to Run 1?—A. That is correct.

Q. Now, take up 3.—A. Now, Run 3. He says the engine horsepower delivered was 42 horsepower with it on; 40.7 with it off. He says fuel consumption in pounds per horsepower per hour is 0.605 with it on; 0.625 with it off. If you divide those again, you get the result that the fuel he used was 25.41 pounds per horsepower at 40 miles per hour; and 25.44 pounds per hours with it off. That again shows that he used less gasoline with the Vacudex on than he used with it off.

Q. And yet, there was, in Run 3, a reduction in the exhaust pressure?—A. Exhaust pressure: I find that the exhaust pressure in the muffler was the same in the two cases.

Q. The exhaust pressure was the same with and without the Vacudex?—A. In Run 3.

Q. So that, taking Run 3 by itself, any savings in gasoline or increase in horsepower could not be due at all, under his own figures there, to reduction in back pressure, could it?—A. That is correct, because he says there was no difference in the back pressure; but yet, he shows an improvement in power, and again he uses less fuel with the device on than with it off. This would, again, indicate that these little differences in the exhaust—and I wish to call your attention to the fact that the differences here are in hundredths of a pound per hour, which are very small. After all, there is a limit to the accuracy that you could get on any kind of a test.

Q. Now, while we are talking about the back pressure exhaust differences, differences in the back pressure before the muffler and after the muffler in each one of those runs, does the back pressure before the muffler—would that govern as to whether or not there was any benefit derived from the apparatus?—A. Yes, sir. The back pressure before the muffler is the only one that means anything as far as the engine is concerned, because that is the back pressure in the pipe leading into the engine, which engine is exhausting. What happens after the muffler, the engine doesn't care about. The pressure in the pipe into which the engine is exhausting is the one that affects the operation of the engine.

Q. Now, that is, before the muffler, then, it would be taking the back pressure in the manifold, would it not?—A. Or the fact that you are taking the pressure between the engine where it is exhausted and the muffler, which slows the gases. The pressure within that pipe can be considered as being uniform.

Q. Yes.—A. That is, it is so near the same that you could not read it on a manometer.

Q. In other words, taking the difference—measuring the back pressure in the manifold would be the same as measuring the back pressure before the muffler?—A. Yes; it would be the same thing in both cases. In other words, he is comparing two tests at the muffler and I am comparing two at the manifold. If you had a manometer on one, if you made the test with a very accurate manometer, the differences in the pressures which would be necessary to smooth the gas along the pipes——

Q. It would be very, very small?—A. It would be very small. But the check which is made before the exhaust pipe and the check which is made at the manifold, they should be definitely comparable. In other words, if you compare at the manifold and before the muffler, that would be a perfectly good comparison.

Q. Now, do you care to make a criticism in regard to the load as shown in Dr. Carvin's report?—A. I had that written on a separate piece of paper.

Q. Do you want to refer to this [indicating]?—A. No; I had some loads tabulated on the file.

Q. You can refer to your own copy rather than the exhibit. Do you have that with you?—A. I don't think I have. Well, anyway, the dynamometer loads which Dr. Carvin used were two to three times that necessary to run the car along a level road. Now, if I remember aright, the horsepower required to run the car on a level road was about three horsepower at about 20 miles an hour; and somewhere around five to six or seven at 30 miles an hour; and at 40 miles an hour it was only about 10 to 12 horsepower. And he used 42. Why, using those figures—I don't know why he used them, but this merely means that in his case he had the car pulling a little hill at 20 miles an hour; a fairly good-sized hill at 30 miles; and just about all the hill the car will pull at 40.

Q. Where do you find that in Dr. Carvin's report?—A. Well, the horsepower in Run 1 was 7.7 horsepower with Vacudex on, and that is on a level road; that would be about three horsepower if I remember aright. The horsepower at 30 miles per hour was 22.3 horsepower; and that would be somewhere around 7 horsepower on a level road.

Q. You mean——A. Necessary on a level road.

Q. All right.—A. And it would be about 12 at 40; and he uses 42.

Q. That would be about 12 horsepower required to run the car? I mean, to run the car on a level road at 40 miles an hour?—A. That is right.

Q. All right. Now, what does that show to you?—A. Wait a minute, I have that [referring to papers]. I might as well give the figures to you correctly. Well, my guess was pretty good. It is 3.6 at 20 miles an hour, that is, horsepower necessary to run the car on a level road; 3.65 at 20 miles an hour; 7.4 at 30 miles an hour; and 13.36 at 40 miles an hour.

Q. Now, where did you get those figures that you just read?—A. We have a formula we use at the Bureau of Standards for computing those loads that brings in the weight of the car and the frontal area of the car and which computes the wind resistance and the road resistance necessary to drive the car.

Q. Now, that formula that you used, is that formula in general use by automotive engineers or just by the Bureau of Standards?—A. They use a similar formula. I think ours is probably better than some of the others, because we have developed this formula during the course of tests made over the last 25 years. These tests were conducted by ourselves and by other interested companies, and we combined all of them. It is a rather big average of a great number of tests.

Q. And it has been checked from time to time for accuracy and it must be accurate then?—A. It has been checked from time to time. It has to be checked; yes, sir.

Q. All right then. Now, what does that show to you, the fact that Dr. Carvin used a greater horsepower than was necessary on the road?—A. Well, I don't believe that that means anything, as far as the tests are concerned. That is, I don't know why he used these various values at various speeds. I say that that merely means that he had the engine pulling different size hills at different times.

Q. In other words, that would show that the conditions under which he claims to receive a benefit from Vacudex are not similar to the ordinary conditions that the car would be under on the road, is that right?—A. Not a great part of the time; that is, the amount of time you are pulling these various hills would be comparatively small, as compared to the overall running time of the car. Under normal conditions, any difference you got would not be very great.

Q. Now, are there any other inconsistencies in Dr. Carvin's report?—A. Well, there is one inconsistency I might point out. The fuel as compared to the effect of the engine power—he claims that there is a difference of 3.2 percent in power and fuel consumption. The fact that those two——

Q. Where is that, now? Where are you reading that from?—A. I guess he just makes that statement.

Q. Over on the "Results" of the tests?—A. Yes; on the "Results." He says, that due to the Vacudex the pounds of fuel per horsepower was decreased 3.2 percent at 40 miles an hour; 8.6 percent at 20 miles an hour.

Q. I see.—A. And that due to the Vacudex the pressure, exhaust pressure in the muffler decreased 4 percent, which does not mean anything. And, let me see—the engine horsepower was increased 3.2 and the fuel was decreased 3.2 at 40 and 8.6 at 20.

Q. Are you still reading from his report?—A. Yes; I am. Now, that is very inconsistent, in that the horsepower can be affected by some such device; but the fuel consumption, there is no reason in the world why that should have any effect on it whatsoever, because any engine will deliver at full throttle the same horsepower per each $\frac{6}{10}$ths of a pound of fuel at almost any speed, and any load. That is true at any speed and nearly any fuel or load; and anything you do to the engine won't change that figure scarcely at all. But here, he comes along and he says, "put the thing on," which doesn't change the pressure at all and yet he says it will increase the economy. If he had said that it had no effect on economy but had increased the horsepower, that wouldn't possibly be bad, because it is very easy to affect the horsepower of an engine. But, to make it give more pounds per horsepower-hour is something else again. But the fact that those two things are alike, according to him, when in fact they are not even similar—that is, the horsepower is very much affected by all kinds of things, as compared to the fuel economy.

Q. Now, I also want to ask you to compare the results of your test with the carburetor test. In regard to the number of tests run, we have here in evidence——

Mr. Hall. What test do you refer to?

Mr. Callaway. All the way through the number of tests; test runs at each speed.

Mr. Hall. All right (Tr. 236, line 22 to line 15, p. 248).

* * * * *

Q. What would you say in regard to the differences in results as to the exhaust pressures shown in the Carvin Report before and after the Vacudex was installed? Are they large enough to exclude the possibility of error?—A. No; they are not, they are very small. In fact, there isn't any difference in one or two of the cases and the ones that there are differences in, they are very small differences. They could by no stretch of the imagination have any effect whatsoever on the economy; and practically a negligible effect on horsepower.

Q. Can you think of any other criticism that you have of the report, Mr. Bruce?—A. I believe not (Tr. 249, line 12 to line 24, p. 249).

* * * * *

Q. Mr. Bruce, let us go back to the proposition that you figured that Dr. Carvin used—a greater load, wasn't it?—A. Yes, sir.

Q. Than was necessary to propel the vehicle on level ground?—A. That is correct.

Q. In driving an automobile, the average automobile, there would be more time spent driving on level ground than up hill, wouldn't there?—A. Yes; by nine to one or something like that.

Q. All right. Now, tests showing what the Vacudex would do in driving up a hill would not give you a fair picture of what it would do when you are driving on level ground, would it?—A. No, sir. The pressures in the exhaust pipe are three or four times the amount of his pressures. Right here, he shows that the pressure before the muffler is almost 13 pounds at 40 miles an hour; and he said it was 4 at 20 miles an hour. So, you double the speed and you multiply the pressure by three. So that he is operating under very much higher pressures in the exhaust pipe—which, incidentally, should be a disadvantage to him.

Q. Yes. Now, is there anything else you would like to say in regard to the testimony about this matter?—A. Of course, this business of messing figures up, or something else, if you divide one figure by another, you get the percent. If you have one of those figures, you can always get the other figure.

Q. It is just a question of mathematics?—A. Yes; just mathematics.

Mr. HALL. But you didn't proceed to compute these differences—I beg your pardon. I thought you were finished.

By Mr. CALLAWAY:

Q. Now, I take it from your testimony that according to facts recognized in the engineering profession, that Dr. Carvin's report contains such inconsistencies that it could not be correct?—A. That is correct (Tr. 257, line 12 to line 3, p. 259).

TESTIMONY OF CLARENCE S. BRUCE AFTER REOPENING OF CASE

Q. Mr. Bruce, you are the same Clarence S. Bruce who previously testified in this case, are you?—A. Yes, sir.

Q. Mr. Bruce, since the last hearing in this case, have there been additional tests of Vacudex, the respondents' product, made at the Bureau of Standards?—A. Yes, sir.

Q. I hand you a paper, marked for identification as Commission's Exhibit 13–A through 13–E," and ask you what that is.—A. It is a report by the National Bureau of Standards on tests of the Vacudex device, submitted by the Federal Trade Commission.

Q. Now, that document, of course, I believe shows the date of the report?—A. The date of the report is June 25, 1946.

Q. And the letter attached, Commission's Exhibit 13–A, shows the date that Vacudex was received at the Bureau of Standards, doesn't it?—A. It was brought to the Bureau by Joseph Callaway on June 6.

Q. So that those tests were made between June 6 and the date of the report?—A. Yes, sir.

Q. Those tests were made under your direction, Mr. Bruce?—A. Yes, sir.

Q. I hand you here——

Trial Examiner DUVALL. One minute, please. Let me see that, will you [the document was handed to the Trial Examiner]?

Trial Examiner DUVALL. What are these enclosures?

Mr. CALLAWAY. That is just the way it came.

Trial Examiner DUVALL. 13–B through 13–E, is that the report?

Mr. CALLAWAY. That is the report; yes, sir.

Trial Examiner DUVALL. All right, go ahead.

By Mr. CALLAWAY:

Q. I hand you an exhibit marked "Respondents' Exhibit 2–A," which has already been introduced in the case. Is that the Vacudex that was used in making those tests?—A. This is the Vacudex that was used in making the second test. It is reported in Exhibits 13–A through 13–E.

Q. Now, Mr. Bruce, the report sets forth accurately, does it not, what was done?—A. Yes, sir.

Q. And the results obtained?—A. It does.

Q. There is a graph attached to the report—first, let me ask you this: The report has two pictures attached to it, marked "Commission's Exhibit 13–D" and "Commission's Exhibit 13–E." Could you explain to us what those pictures represent?—A. Yes, sir. Picture 13–D shows the set-up in the dynamometer laboratory and is a side view of the 50-horsepower Buffalo blower used to blow the air stream to operate the device during the test. It shows the gate which allows the intake air supply to the blower to be closed off or opened up to change the air speed.

Q. What was the purpose of closing or opening up the gate?—A. It was used to open the entrance to the blower, which would increase the air speed over the device, and closing it would decrease the air speed.

Q. Now, let us see. This test was what is known as a laboratory test on a stationary engine, was it?—A. Yes, sir.

Q. Now, in order to simulate the conditions of a car moving, that is, the velocity of the air rushing against the Vacudex as a car moved, in order to similate those conditions, you use a blower to blow air by the Vacudex, is that right?—A. That is correct.

Q. And opening or closing that gate that you have mentioned there would increase or decrease the speed of the air; is that right?—A. That is correct.

Q. The velocity of the air, I mean.—A. Yes; the previous chart, Exhibit 13–C, is a chart showing the air speed at different gate settings.

Q. In other words, if I understand you correctly, if in the laboratory tests you are running an engine at a speed to be compared with a car traveling at 20 miles per hour, when a car travels 20 miles per hour, the air is rushing against the Vacudex at a certain rate, isn't it?—A. Yes, sir.

Q. And as you increase the speed of the car, the speed of the air rushing against the Vacudex is increased, isn't it?—A. Yes, sir (Tr. 270, line 24 to line 8 p. 274).

* * * * *

Q. Now, then, does the opening and closing of the gate then—just state what was the purpose of that.—A. It was necessary in the laboratory to produce an air speed over the device equivalent to that which it might get on a car when operating on the road, so if a road load of 50 miles per hour were used on the engine, the gate opening would be adjusted so that a 50-mile-per-hour air speed was produced on the device.

Q. Now, let us see. In that test, which is reported here, can you gage the speed of an engine in the laboratory to run at the same rate as the engine would be running if it were pulling a car at 20 miles per hour?—A. Yes, sir. All you would have to do is to know the tire size and gear ratio and you could compute the engine speed at any car speed.

Q. And you did that?—A. We did that.

Q. Just go ahead and explain, then, how the test was made in regard to setting the engine speed and the air speed rushing past the Vacudex to correspond.—A. Well, for instance, if the road speeds used were 20, 30, 40, and 50 miles per hour, the air speed over the device was adjusted to those values. For instance, if the road speed test was 40 miles per hour, the blower was adjusted to blow 40 miles per hour air speed. The load on the dynamometer was set sufficient to drive the car at 40 miles per hour, and the device was taken off, then put on, and the fuel consumption measured.

Q. Was anything else measured but the fuel consumption? Was the back pressure measured?—A. Yes; the back pressure was measured.

Q. With and without the device?—A. With and without the device, and that applies also to the fuel consumption. Of course, the horsepower was set, and the speed was set.

Q. Now, look at Exhibit 13–E. What does that represent?—A. Exhibit 13–E is a photograph, taken from above the tail pipe, showing the device attached, and showing the tail pipe extending out of the pipe through which the blower air was supplied.

Q. Now, let us see. Do I understand, then, that the picture, Exhibit 13–D, shows the front end of the blower with which the air was blown?—A. That shows the delivery end of the blower, or the pipe attached to the delivery end of the blower.

Q. And is Exhibit 13–E a continuation of the same pipe that is shown in Exhibit 13–D?—A. Yes, sir; it is the end of the same pipe shown coming from the blower in Exhibit 13–D.

Q. And would the air then come out of the big metal pipe shown in Exhibit 13–E and rush against the Vacudex shown attached to the tail pipe in that picture?—A. It would, sir.

Q. In your opinion, would that simulate the conditions of air rushing against the Vacudex if it were attached to a car traveling along the road?—A. At least we know in this case that the Vacudex had an air speed of 50 miles per hour over it. In a car, where the Vacudex is affected by all the parts of the car, there might not be a 50-mile-per-hour blowing over the Vacudex at a speed of 50 miles per hour.

Q. In other words, do I understand you to be saying by that this laboratory test that you made is more accurate than a test on the road?—A. Yes, sir. In the laboratory we produce a definite air speed over the device, where on the road you have an air speed depending on the conditions existing at the time of the test.

Q. Now, was any instrument there measuring the back pressure created in the engine, or the exhaust pressure?—A. Yes, sir; there was.

Q. And was that measured at different speeds, with and without the Vacudex attached?—A. Yes, sir; it was measured at each of these four speeds with and without the Vacudex device.

Q. Was there any difference in the exhaust pressure with and without the Vacudex?—A. There was no measurable difference in the exhaust back pressure with and without the Vacudex.

Q. Did you also measure the gasoline consumption?—A. Yes, sir; we did.

Q. And what did you find in that respect? The report sets forth what you found, does it?—A. The report sets forth the road speed and miles per gallon with the Vacudex and miles per gallon without the Vacudex, and then a random distribution, sometimes higher and sometimes lower, slightly. The average of all speeds was with the Vacudex device 20.66 miles per gallon, and without the Vacudex device 20.63 per gallon.

Q. Now, is the difference within the range of experimental error?—A. It is well within the range of experimental error of the test, so therefore we would say there was no difference in the fuel consumption, whether you used the device or did not use the device.

Q. Let us see if I understand you. There was no difference in the back pressure or the exhaust pressure?—A. There was no difference in the back pressure or the exhaust pressure.

Q. There was no difference in the fuel consumption?—A. There was no difference in the fuel consumption.

Q. Without or with the device at the various different speeds?—A. Yes, sir.

Q. In other words, Mr. Bruce, did the Vacudex affect the operation of the engine in any way?—A. The Vacudex device has no measurable effect upon engine operation.

Q. Now, you have already given your opinion in this case. Now, based on this test and your experience as an automotive engineer, you have stated that the Vacudex did not affect the operation of the engine in any way; is that right?—A. Yes, sir.

Q. Does that mean that it did not increase the power of the engine?—A. Yes, sir; it does.

Q. Did it draw any carbon from the oil or moisture from the muffler?—A. It did not.

Q. Did it reduce the vibration of the engine?—A. It did not.

Q. Did it give the engine less vibration, less strain?—A. It did not.

Q. Did it cause it to run more smoothly?—A. It did not (Tr. 274, line 14 to line 13, p. 279).

* * * * *

A. The details which I have testified about are results of the tests, and I was present and participated in the working out of the results of those tests. I did not see any of the measurements taken.

Q. And you did not observe any of the conditions of the apparatus used in the tests at the time the actual tests were going on, is that right?—A. No; I did not.

Q. You were not present?—A. I was present when some of the preliminary tests were run.

Q. I am asking you about when these details transpired, I am not asking you about any other time. You have testified as to the details of the tests. Were you present when those details transpired, when the tests were actually made?—A. I stated I was not present, and made none of the measurements myself (Tr. 281, lines 2–18).

* * * * *

A. I gave all the information necessary to the details of these tests. They were conducted under my direction and full supervision, as are all the other tests which are conducted (Tr. 282, lines 17–20).

* * * * *

A. I have other people, subordinates, who make these tests (Tr. 283, line 2).

* * * * *

Q. Who did actually make this test?—A. Mr. Duck and Mr. Robertson.

Q. Mr. Duck has already testified in this case, hasn't he?—A. I don't know.

Q. Mr. Bruce, who actually——

Mr. Callaway. Excuse me just a minute. Do you have another copy of that report with you?

The Witness. Yes; I have a green carbon.

Mr. Callaway. Suppose you refer to it as the question is asked.

The Witness. This is a green carbon file copy of the Bureau of Standards.

By Mr. Hall:

Q. Who actually wrote the report that you have just testified about, Commission's Exhibits 13–A to 13–E?—A. Mr. Duck (Tr. 292, lines 10–25).

* * * * *

Mr. Callaway. And this report was issued, and although it was written by Mr. Duck, it came across your desk and had your approval before it was issued?

The Witness. It did, sir (Tr. 295, lines 16–19).

* * * * *

By Mr. CALLAWAY:

Q. Mr. Bruce, you stated a while ago on cross-examination the engine that was used in making this test, I believe you said, was a Chevrolet engine, if I make no mistake?—A. That is correct.

Q. Were you mistaken in that?—A. Yes; I was speaking from memory. As to the previous test that was spoken of in the front of the report, it was made on a 1938 Chevrolet, with a 1938 muffler. These last tests were made on a 1940 Ford V–8, with a Ford muffler, and that is so stated in this report. If I had refreshed my memory from the report, I would have made a correct statement (Tr. 298, line 15 to line 1, p. 299).

TESTIMONY OF JESSE T. DUCK AFTER REOPENING OF CASE

Q. You are the same Jesse T. Duck who has testified previously in this case, are you?—A. I am.

Q. Mr. Duck, before, in giving your qualifications, I do not believe I was informed as to your rating at the Bureau of Standards. What classification do you have there?—A. I am an assistant automotive engineer.

Q. Do you have a rating as automotive engineer?—A. That is true.

Q. A Civil Service rating as an automobile engineer?—A. Yes, sir.

Q. And you were so rated at the time you testified before, were you not?—A. That is true (Tr. 300, line 23 to line 11 p. 301).

* * * * *

Q. Mr. Duck, I hand you an exhibit, marked "Commission's Exhibit 13–A through 13–E," which Mr. Bruce has identified as the report on the tests made on a stationary engine at the Bureau of Standards, under his supervision. Were you the one that actually made those tests?—A. I was.

Q. Does that report accurately reflect what you did?

Mr. HALL. Your Honor, I object to what it accurately reflects. He can ask him about the report, but the witness has no right to give his opinion whether it actually states the facts or not with reference to the tests made. That is the purpose of the report, to state the facts. He asked him if it accurately states in the report the facts on the test. It is asking for an opinion of the witness and not facts. Whether it is accurate or inaccurate is not a question for the witness to decide, and for that reason we object.

Trial Examiner DUVALL. What is your question?

Mr. CALLAWAY. I asked him if that report accurately reflect what he did, and the results which he obtained.

Trial Examiner DUVALL. Let me see that report [the document was handed to the Trial Examiner].

Trial Examiner DUVALL. Why don't you ask this witness what part he took in it and what he did?

Mr. CALLAWAY. I did, and he said he did the work.

Trial Examiner DUVALL. He did not write this report?

Mr. CALLAWAY. Yes, sir; he did.

Trial Examiner DUVALL. He wrote this report?

Mr. CALLAWAY. Yes, sir.

Trial Examiner DUVALL. Why don't you ask him something about that?

By Mr. CALLAWAY:

Q. Did you write that report, Mr. Duck?—A. I wrote the report.

Q. Of course, it is not over your signature, but you actually wrote it?—A. That is right. Such reports are signed by the section chief, regardless of who does the work, but it always bears the initials of the person who writes the report, and my initials are on the report.

Trial Examiner DUVALL. As I understand you, this report, which is in evidence, Exhibits 13–A through 13–E, was prepared by you?

The WITNESS. Yes, sir.

Trial Examiner DUVALL. And actually is your report, although it is signed and transmitted by Donald B. Brooks?

The WITNESS. That is true.

By Mr. CALLAWAY:

Q. Now, did you do that work under Mr. Bruce's supervision?—A. I did.

Q. Did he outline the procedure to be followed?—A. I believe he did—at least we worked it out. Either that, or he and I worked it out together in conference.

Q. Then did he see the set-up after you did set it up, the equipment?—A. He did.

Q. And was he present when some of the trial runs were made of the engine and blower?—A. That is right, he was present (Tr. 301, line 24 to line 9, p. 304).

* * * * *

Q. Now, after that report was written by you, it was submitted to Mr. Bruce, was it?—A. That is right; it was.

Q. And then it had his approval as a report of the Bureau of Standards?—A. It did.

Q. Then of course it went up the line and had the approval of the Bureau Chief, did it not?—A. It is an official act of the Bureau of Standards.

Q. Now, Mr. Duck, there are some instruments that I see mentioned in that report. You have explained previously the way that some of the instruments work. I notice there is one term there that has not been previously explained. It is stated there that "A pitotstatic tube was used to measure the velocity pressures at points on the horizontal and vertical traverses of the ducts," and so forth and so on. What is a pitotstatic tube?—A. A pitotstatic tube is an open tube that has an open end and the open end is directed directly into the air stream so you can get velocity pressure. There are two connections. One end of the manometer is connected with the atmosphere and the other end is connected with the other end of the tube which receives the impact pressure, which is coming from the duct.

Q. And that is used to measure the velocity of the air?—A. That is true.

Q. Now, then, in measuring the back pressure or the exhaust pressure in this set-up, where was your instrument attached?—A. Maybe I had better look at the picture to find out exactly. It is attached just beyond the junction of the two arms of the exhaust pipe. That is, there are two exhaust manifolds in a V–8 Ford engine which are joined in the tail pipe. Well, the manometer was connected with the exhaust pipe at a point somewhere beyond a foot beyond the junction of the two arms of the exhaust pipe.

Q. In other words, the exhaust pipe is connected to the engine by the manifold; is that right?—A. That is right.

Q. And you say there are two arms of those in a Ford V–8 engine?—A. That is right; there are two exhaust pipes.

Q. They join into the exhaust pipe proper; is that right?—A. That is right.

Q. And then going further on down the line you have the muffler?—A. That is right.

Q. And then after the muffler you have the tail pipe?—A. That is right.

Q. Now, did you take your exhaust pressure in between the engine and the muffler?—A. That is right.

Q. In other words, it was not at the end of the tail pipe where you were measuring the exhaust pressure, was it?—A. It was not; it was in the exhaust pipe.

Q. In front of the muffler?—A. I would say in front of the muffler, meaning it was between the muffler and the engine.

Q. I think that is all right. Now, Mr. Bruce—excuse me, Mr. Duck—you have stated in your report there that the Vacudex did not affect the operation of the engine in any way.—A. It did not.

Q. You were there present at the making of these tests?—A. I was present during every observation that was made.

Q. Did the Vacudex increase the power of the engine?—A. It did not.

Q. Did it cause the engine to give better performance?—A. It did not.

Q. Did it draw any carbon, oil, or moisture from the muffler?—A. I saw no evidence of any such occurrence.

Q. Did it reduce the vibration of the engine?—A. Not to any noticeable extent.

Q. Did it give the engine greater acceleration?—A. It made no change in the acceleration.

Q. Did it cause the engine to run more smoothly?—A. It did not.

Q. In other words, your statement that it did not affect the engine, the operation of the engine in any way, would cover all of that, would it not?—A. It would.

Q. Now, did you follow the instructions in attaching this Vacudex?—A. We did, sir.

Q. Where did you find those directions? On the carton that was brought out there?—A. What directions there were on the the carton. The directions were not very detailed, but those directions were followed.

Q. And you made these tests yourself?—A. That is right; assisted by——

Q. Mr. Robertson?—A. Mr. Robertson (Tr. 306, line 14 to line 4, p. 310).

* * * * *

Q. You say you received instructions about making the test; is that right?—A. Would you make the meaning of that question clear, please?

Q. Did you receive instructions about how to proceed with this test?—A. I had Mr. Bruce approve the plans for making the test.

Q. When you discussed this with Mr. Bruce, did you have the respondents' patent before you?—A. We did not.

Q. Did you discuss the patent?—A. We did not.

Q. Did you discuss the specifications in the patent?—A. We saw no reason why we should (Tr. 320, line 20 to line 8, p. 321).

* * * * *

A. We did test the Gasconomy device, Mr. Hall.

Q. What did that have to do with the test of Vacudex?—A. The test that we made of the Gasconomy device had nothing whatever to do with the Vacudex device, but there were certain tests that we made without the Gasconomy device attached to the engine (Tr. 339, line 19–24).

* * * * *

Q. And using that for a test of Vacudex?—A. I have already said that we did not use the tests that we made of the Gasconomy device in the report for the Vacudex, but that there were certain tests that we made to show the effect in a reduction of back pressure by whatever method or device it was made (Tr. 341, lines 1–6).

* * * * *

By Mr. CALLAWAY:

Q. Now, he was talking to you about the large duct shown on Commission's Exhibit 13–E. The large duct to which you refer was the piece of galvanized pipe through which the air came from the blower onto the Vacudex, is that right?—A. That is right (Tr. 363, lines 15–20).

* * * * *

Q. Now, Mr. Hall questioned you before about whether or not the tail pipe used in this experiment was a standard Ford tail pipe, and I believe you told him that it was not a standard Ford tail pipe. In your opinion would the fact that it was not a standard Ford tail pipe have any effect upon the validity of this experiment?—A. I think it would have had no effect whatever.

Q. Did you use the same tail pipe with the Vacudex on and with the Vacudex off?—A. We did.

Q. In other words, the conditions were exactly the same, so far as the tail pipe were concerned, with the Vacudex installed, as they were with the Vacudex off?—A. They were the same in all particulars with the Vacudex on as they were when it was off.

Q. Now, why could you not use a standard Ford tail pipe in this experiment?—A. The dynamometer was in the same relative position that the end of the tail pipe would be in an actual automobile, so we had to bend it slightly away from the engine in order to make it possible to install the air duct.

Q. In other words, the dynamometer is fastened on an instrument panel that is permanently placed there in the laboratory?—A. The dynamometer is coupled directly behind the engine.

Q. Yes; but isn't there an instrument panel there, shown in the picture?—A. I am not sure. Yes; it does show the instrument panel. However, the instrument panel did not interfere with the installation. There was only the dynamometer and its support.

Q. Now, how long have you worked with Mr. Robertson, the gentleman who assisted you in making this experiment?—A. About three years. It may possibly be a little more.

Q. Has he assisted you in making other experiments at the Bureau of Standards?—A. He has been my assistant in all laboratory tests (Tr. 364, line 1 to line 11, p. 365).

* * * * *

Q. Have you observed his work there at the Bureau of Standards?—A. I have.

Q. From your observation of his work there, is he capable of doing the work which he did (Tr. 365, lines 16–20)?

* * * * *

Q. In connection with this experiment.

Mr. HALL. We object.

The WITNESS. He is entirely capable (Tr. 365, lines 23–25).

TESTIMONY OF HAYWOOD L. ROBERTSON

By Mr. CALLAWAY:

Q. State your name, please.—A. Haywood L. Robertson.

Q. Mr. Robertson, where do you live?—A. Arlington, Virginia.

Q. Are you an employee of the Bureau of Standards?—A. Yes, sir.

Q. And what department are you employed in?—A. Heat and power, Division 3.

Q. How long have you been so employed?—A. Approximately three years.

Q. Have you been, during that period of time, assisting Mr. Duck in making various tests at the Bureau of Standards?—A. Yes, sir; I was assigned to Mr. Duck when I entered service there.

Q. Did you assist him in making this test of Vacudex, as reflected in Commission's Exhibits 13–A to 13–E?—A. I did.

Q. What has been your previous experience before going to the Bureau of Standards, Mr. Robertson?—A. Well, I was with Civil Aeronautics three years, the Airway Traffic Control Division.

Q. What kind of work did you do there?—A. That is controlling air traffic. Prior to that, I was in the aircraft business, operating an airport for 15 years. My brother and I jointly ran the airport.

Q. What other experience, if any, have you had in mechanical work?—A. Well, I did a good portion of mechanical work on the airplanes, as well as fly them and instruct.

Q. Have you had, before you made this test of Vacudex, or assisted in making this test of Vacudex, any experience in reading the type of instruments mentioned in this report?—A. Yes, sir.

Q. Now, just what did you do in connection with this test of the Vacudex?—A. Well, I read the gas flow, the gas measuring device.

Q. As to how much gas was used?—A. That is correct; and the temperature of the fuels.

Q. What is that?—A. And the temperature of the fuel at the time of the measurement.

Q. Now, then, what did you do when you read it?—A. We used the stopwatch during the flow of the gas, at the start and at the stop, and computed the time.

Q. Did you give those figures to Mr. Duck?—A. I gave those figures to Mr. Duck.

Q. And he did the computation?—A. That is right.

Q. Now, did you and Mr. Duck together attach the Vacudex to the end of the tail pipe?—A. I attached the Vacudex to the end of the pipe.

Q. Was Mr. Duck present when it was done?—A. Mr. Duck was present.

Q. Now, the Vacudex had to be put on and taken off and put on and taken off again a number of times, did it not?—A. Yes, sir.

Q. And did you put it on and take it off each time?—A. I did.

Q. In Mr. Duck's presence?—A. Yes, sir.

Q. Just what did you do when you put it on? I show you Respondents' Exhibit No. 7, which is a carton containing directions for installing the Vacudex. Did you see that before?—A. Yes, sir.

Q. Where?—A. At the Bureau, and I had instructions with me at the time of the installation.

Q. Now, how far did you put the Vacudex on the end of the tail pipe?—A. I put it on according to instructions, with the seam at the bottom.

Q. Are you sure of that now?—A. Positive.

Q. And then how far did you shove it up on the pipe?—A. Well, I did not measure it. I put it on according to the instructions, and marked the tail pipe as to that length that it was on the tail pipe, and then when it was taken off each time, it was slid back to this mark on the tail pipe, so there was no difference in the distance on the tail pipe at any time; no difference in the distance there.

Q. Did you fix it securely to the tail pipe each time?—A. Yes, sir.

Q. Does the inside of the Vacudex show approximately how far it was shoved on?—A. I would say so; yes, sir.

Q. Now, that Vacudex had been tested before, of course, before it was brought out to you. At least, does the inside of the Vacudex show that it was shoved on as far as the end of the crimp?—A. Yes, sir; it does (Tr. 372, line 7 to line 22, p. 375).

* * * * *

Q. Now, did you see or did you not see, in so installing the Vacudex, each time that air could flow into each one of the cones?—A. Yes, sir; I did. There was no restriction in regard to the cones at any time. It was carefully put on, per instructions. The tail pipe was marked so we would not have to bother to check each time by sighting the end, as to how far you had it on. Therefore, I marked the tail pipe so each time I could slide it back to that mark.

Q. Now, this instrument that you read in regard to the amount of fuel used, what experience have you had in reading such instruments before you assisted Mr. Duck in making this test?—A. Approximately three years.

Q. And this instrument you read in regard to the temperature of the fuel, how much experience have you had, if any, in reading such instruments, before you assisted Mr. Duck in making these tests?—A. Well, that was just a little thermometer that the gas passes by (Tr. 376, line 2 to line 21).

FURTHER TESTIMONY OF CLARENCE S. BRUCE AFTER REOPENING OF CASE

Q. Mr. Bruce, you heard the statements made by Mr. Duck on the witness stand as to the fact that this was not a standard tail pipe, a standard Ford tail pipe, that was used in these tests, did you not?—A. Yes, sir.

Q. And you heard the statements made by him in regard to the equipment and the set-up there?—A. Yes, sir.

Q. In your opinion, would the fact that these items were not standard equipment have any effect on the validity of this test?—A. It could not.

Q. It could not?—A. It could not.

Q. Why do you say that?—A. If you change tail pipes or exhaust pipes or mufflers or clog it up or restrict it, or open it up, you change the condition under which the engine operates. If you give the engine a definite muffler, tail pipe, and exhaust pipe, that engine's power will be determined by the resistance of that combination. Now, that combination was used both with and without Vacudex, consequently the combination has——(Tr. 380, line 21 to line 18 p. 381).

* * * * *

The WITNESS. This set-up was set up according to my instructions. I inspected the set-up and saw that it was according to my instructions. Now, I am testifying about that set-up which I instructed to be set up, and that I inspected and saw it was set up that way, and that is the way it was used (Tr. 382, line 13–18).

* * * * *

Q. Continue, now, with your answer, please. You were talking about the things being used without and with Vacudex.—A. That is right. If the set-up, the same combination of muffler, exhaust pipe, and tail pipe is used, then the function of that engine remains exactly the same with that combination, and all of these statements pro and con in the record about what changes in the exhaust pipe will or will not do have nothing to do with this situation whatsoever. The situation is absolutely determined by the combination, and the combination is fixed. That fixed combination was used with and without the device, put on and taken off within minutes of each other. A set of runs would be made, and the device would be taken off and the readings would be made, and the device put on, readings made, and the device taken off. That would go on through the whole test. There was no time for any change whatsoever to occur in the exhaust system. So the clogging of the pipes, or the stopping up of the exhaust pipes, or cleaning out exhaust pipes, has not entered into this test whatsoever (Tr. 383, lines 1–20).

TESTIMONY OF JAMES H. LAMB

Q. State your name, please.—A. James H. Lamb.

Q. Where do you live, Mr. Lamb?—A. I live in Arlington.

Q. Arlington, Va.?—A. That is right.

Q. What kind of business are you in?—A. I am secretary of the Contest Board of the A. A. A., American Automobile Association.

Q. How long have you been secretary?—A. Since last August 1st.

Q. Were you assistant secretary before that?—A. I was assistant secretary of the Contest Board from 1935 up to January 1, 1942.

Q. During the time you were assistant secretary did all matters in regard to tests of automotive engines authorized and made by the American Automobile Association come to your attention?—A. That is right.

Q. The record in this case shows, Mr. Lamb, that Mr. Ferdinand E. Arrigoni of 1105 Jerome Avenue, New York, testified at the last hearing this:

"I went to work in the Contest Division of the American Automobile Association in the capacity of supervisor of automotive runs of experimental tests, that they were called upon to make tests and reports until the period of the war, until 1941, and at that time I went into business for myself."

Do you know Mr. Arrigoni?—A. Quite well.

Q. Well, Arrigoni further testified at the last hearing in this case that he made a test of Respondents' product, a device called Vacudex, which is to be attached to the tail pipe of an automobile, that he made a test of that product in 1941 for the Respondent, Mr. Decker, making the test as an official of the American Automobile Association Contest Board. Will you please state what Mr. Arrigoni's connection was with the American Automobile Association, or the Contest Board?—A. Mr. Arrigoni was hired by us to supervise the midget racing activity in the metropolitan area.

Q. Of New York?—A. That is right.

Q. Did he ever have any authority for making tests of automotive engines, or automobiles?—A. No, sir. He was not authorized. He was not qualified to conduct the tests (Tr. 511, line 13 to line 10, p. 513).

TESTIMONY OF DONALD B. BROOKS

Q. State your name, please.—A. Donald B. Brooks.

Q. Where do you live, Mr. Brooks?—A. Chevy Chase, Md.

Q. Where are you employed?—A. At the National Bureau of Standards.

Q. In what capacity?—A. As chief of the automotive section.

Q. How long have you been employed at the National Bureau of Standards?—A. Since November 10, 1927, but I was employed there previous to that time also.

Q. You were out a while, and then came back?—A. Yes.

Q. When did you first start with the Bureau of Standards?—A. I first started in 1919.

Q. And you were employed until when?—A. Simply as a summer student assistant.

Q. I see.—A. And again 1921. Then from July 17, 1922, until September 30, 1924.

Q. Then you were out until the last employment that you mentioned?—A. That is right.

Q. And your employment has been continuous there since 1927?—A. That is correct.

Q. Up to the present time?—A. Yes.

Q. What section or division has been your line of work, Mr. Brooks?—A. I have been in the automotive section since 1922, with the exception of the period spent outside of the Bureau.

Q. In the automotive section?—A. Yes.

Q. What have been your duties in the automotive section to start out with, or to begin with?—A. Initially as a laboratory engineer operating tests and supervising one or more mechanics. Then successively the supervision of larger units in test work, and for approximately the last 10 years almost entirely supervisory.

Q. Your whole period of time with the National Bureau of Standards has been in connection with automobile engines?—A. Since 1922; not prior to that time.

Q. Since 1922, it has been in connection solely with automobile engines?—A. Yes, sir.

Q. How long have you been chief of the automotive section?—A. Since September 9, 1943.

Q. And what were you just prior to that?—A. I was in charge of a group which, immediately prior to September 9, 1943, consisted of approximately 40 people in the automotive section. It was one of the groups of the automotive section.

Q. Now, the Commission would like to know something of your educational qualifications, too, Mr. Brooks?—A. I received the degree of Bachelor of Chemical Engineering from the Ohio State University in 1921; a degree of Master of Science in 1923, and a professional degree of chemical engineer in 1927.

Q. Now, what rating do you hold under Civil Service in the National Bureau of Standards (Tr. 534, line 15 to line 25, p. 536)?

* * * * *

Q. The National Bureau of Standards is under Civil Service, is it not?—A. Under Civil Service I am classified as principal automotive engineer.

Q. How long have you been so classified, if you can remember?—A. Approximately five years. I cannot state with certainty as to just that classification (Tr. 537, lines 6–12).

* * * * *

Q. You said principal automotive engineer. Did you have a classification as automotive engineer prior to that classification?—A. Yes. When I entered the Bureau of Standards, the National Bureau of Standards in 1927, I took a civil service examination and was rated as automotive engineer. Since that time I have had promotion through two other grades to the present level.

Q. Now in addition to the experience which you have told us about, and your educational qualifications, have you made any study of statistics and statistical methods of computations, and things like that?—A. Yes. I have had courses under Professor Dantzig and Professor Deming, and have furthermore studied approximately 10 or 12 books on statistics, the names of some of which I could give, if you wish.

Q. I would like to have them?—A. Fisher's Statistical Methods for Research Workers is one of the books. Statistical Methods for Engineers is another. The author I cannot recall. A recent book by Professor Deming on the Adjustment of Statistical Data. Those are samples.

Q. Now, these professors under whom you studied, under whom you said you had courses, what schools are they connected with?—A. Professor Dantzig was at that time connected with the University of Maryland. Professor Deming at that time, at the time I took the course, I believe was with the American University. He now, I understand, is with the Department of Commerce.

Q. Now, the studies in regard to the statistics you have told us about, do they deal, at least in part, with methods or formulae for determining experimental error?—A. Yes.

Q. Is there any formula or method for determining the experimental error in laboratory tests in automobile engines?—A. The formula for determining experimental error would be the same regardless of the nature of the test.

Q. Then there is a formula which could be used in determining the experimental error either of a laboratory test of an automobile engine, or a road test of an automobile engine; is that right?—A. Yes.

Q. Mr. Brooks, what is the experimental error in road tests of automobile engines?—A. In my opinion, it is five to ten percent.

Q. Five to ten percent?—A. Yes.

Q. Mr. Dutcher testified for the Respondents in the hearing in this case——(Tr. 537, line 19 to line 20, p. 539).

* * * * *

Q. (Continuing.) In which he said he had made certain road tests with this device in question in this proceeding, called Vacudex, and that the road test which he made showed a saving of from three to eight percent in gasoline mileage over gasoline mileage obtained without the Vacudex. That saving, then, according to your statement, if obtained, as within the experimental error of road tests?—A. It would be; yes, sir.

Q. Another witness, Mr. Arrigoni, testified——(Tr. 540, lines 2–10).

* * * * *

Q. If using a gasoline measuring device, a Hinckley-Meyers gasoline measuring device, on a measured gallon of gasoline, 11.9 miles were obtained out of a gallon of gasoline using Vacudex, and only 11.3 miles were obtained out of the same automobile and out of a gallon of gasoline without the Vacudex, would that difference be within the range of experimental error of a road test?—A. It would be within the range of the customary experimental error; yes (Tr. 541, lines 14–22).

* * * * *

Q. Now, Mr. Brooks, I show you Commission's Exhibit 13–A through 13–E in this case, which is a report and letter accompanying the reports from the Bureau of Standards of a test of the product of the Respondents called Vacudex. I believe that the report is signed by you, isn't it, Mr. Brooks?—A. Yes.

Q. Mr. Clarence Bruce is under your supervision out there in the Automotive Testing Section, is he not?—A Yes.

Q. And also Mr. Street and Mr. Duck?—A. Yes.

Q. You have seen that report, of course, that is before you, and signed it before it was sent out, have you not?—A. Yes.

Q. If in the test shown in that report at the National Bureau of Standards the tail pipe used in the test set-up was not a standard Ford tail pipe, or the pipe in front of the muffler, in between the muffler and the manifold was not a standard Ford pipe, suppose either one or both of them were longer or shorter than the standard Ford pipes, in your opinion would that affect the validity of the test, or the validity of the results obtained? Look at the test. It was conducted, I believe it shows, at 20, 30, 40, and 50 miles per hour speeds, approximating 20, 30, 40, and 50 miles per hour.—A. Well, the test would be valid if it is correctly conducted; that is, if measurements are made with accuracies and if no source of constant error is included in the result. I do not believe I quite understand the sense in which you use the word "valid."

Q. You understand what I mean about the difference in the tail pipe?—A. Yes.

Q. I mean there being such variation as I have outlined, would that keep that test from being a fair test of the product Vacudex?—A. In my opinion, it would not.

Q. And would it be a fair test of what the product Vacudex could be expected to accomplish, or fail to accomplish, on a Ford car? I believe it shows a Ford V–8 engine was used.—A. In answer to that, our laboratory set-up was intended to duplicate to a sufficient degree the performance on the road of a car. It is not necessary to duplicate it with high fidelity, inasmuch as the test is run at a series of speeds, and is run with and without the device. While changing the length of the exhaust pipe before or after the muffler might conceivably have a slight effect on the total power developed at a given speed, and if a device were intended to operate by action on any resonance in the exhaust pipe, such change might reasonably suppress its efficacy at one speed. However, in that event the efficacy would be augmented at some other speed. In other words, an exhaust system is somewhat like an organ pipe in that there is resonance at certain engine speeds. If the length of the pipe is changed the speed at which the resonance occurs is changed, also. Thus, a device intended to function in conjunction with the resonance in the exhaust pipe conceivably would function at one speed, but either would not function or would function with greatly diminished efficacy at some other speed. In view of the fact that our tests were run at a series of speeds covering the range from 20 to 50 miles per hour, any improvement which might be caused by the use of the device necessarily would show at one of those speeds.

Q. So, then, if I understand you, if there was any benefit, or detriment, on account of the difference in the length of the tail pipe from a standard tail pipe, such difference or benefit would be canceled out by the running at the various different speeds; is that right?—A. It would be canceled out of the average; yes.

Q. Yes.—A. That is, any such effect should show, necessarily would show at one of the four speeds used.

Mr. CALLAWAY. That is all of Mr. Brooks (Tr. 542, line 1 to line 25, p. 544).

CROSS-EXAMINATION

Q. But you are over Mr. Bruce?—A. I am in charge of the Automotive Section of the Heat and Power Division of the National Bureau of Standards.

Q. The Heat and Power Division?—A. Yes (Tr. 548, lines 6–10).

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TESTIMONY OF FRANK D. CARVIN

A. On these tests we maintained a constant r. p. m. as the fixed constant. If there is any improvement or not, it will show up in some other change, so we tried to maintain our speed constant, and then with the Vacudex on and off, we adjusted the throttle of the engine to keep it at a constant speed (Tr. 479, lines 15–20).

EXCERPT FROM RESPONDENTS' EX. 4, REPORT OF FRANK D. CARVIN

"Tests were made at constant engine speed and *constant throttle opening* for each car speed, first with the Vacudex on and then with the Vacudex removed." [Italics supplied.]

TESTIMONY OF FREDERICK H. DUTCHER

Q. Will you just briefly describe the tests that you made and what you did?—A. Yes. I used three cars, one of which was borrowed from a friend of mine, and two of which were furnished me by Mr. Decker. The first car was driven over the Merritt Parkway in Connecticut, and was run over a stretch of road, I would say approximately 10 or 12 miles long. The car was fitted, both before and after the installation of this device, with a fuel-measuring device, so arranged that gasoline could be taken from the tank of the car or from the device, which contained a known quantity of gasoline, I believe one-tenth of a gallon, so that the car could be switched from its own tank to the device at any given time, the mileage noted when the car was switched to the measuring device, full and empty, and then switched back to the car's tank again, without interrupting the progress of the car. In order to get several tests, the landmarks beside the road were noted when the first series of tests were made, and the same landmarks used when the car passed over the ground the second time with the device installed. Inasmuch as this device was supposed to operate at 40 miles per hour, and it is my recollection that Mr. Decker indicated it would not do so well under 40 miles per hour, although that is merely a recollection, your Honor, the car was driven at 40 miles per hour as nearly as it was possible for the driver to hold it there, and I was driving. If I might say so, I can drive a car at 40 miles per hour. The various spots were noted, I believe there were five on this first run, and then the distance on the speedometer, or the odometer, I believe they call it, was read at the beginning and end of each of these tests (Tr. 407, line 2 to line 7, p. 408).

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Q. Mr. Dutcher, continue with your describing the test.—A. That was one car.

Q. That was one car. Now, how many trips did you make with the Vacudex?—A. We made one trip up and one trip back, one trip east and one trip west. Installing the Vacudex was a matter of a few minutes, and we went over the same ground east and west.

Q. That was on one car?—A. That was on one car, and we made tests on two others.

Q. Did you follow the same procedure?—A. We followed the same procedure in a different locality. This time it was done on the Sawmill River extension—no; I beg your pardon, the Hutchinson River extension.

Q. Are you able to recollect the types of these cars?—A. I think one was a Plymouth and one was a Dodge taxicab, or vice versa. The first car was a Dodge convertible.

Q. Now, what did you find out about the invention Vacudex? What were the results that were disclosed to you by these tests?—A. There was a slight improvement in fuel consumption.

Q. Do you remember approximately the amount of improvement in figures?—A. Yes; it ranged from just over 3 to around 8, I should say.

Q. Eight percent?—A. Yes. That would be on an average. The individual figures indicated a somewhat wider spread.

Q. In other words, a saving in gasoline was disclosed from 3 to 8 percent by the use of Vacudex?—A. That is right.

Q. Did you make these tests yourself in person?—A. I made them myself personally (Tr. 409, line 17 to line 23, p. 410).

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TESTIMONY OF FERDINAND E. ARRIGONI

Q. You made the test, then, two days after that motion was passed, that all activities be suspended?—A. That is right.

Q. So you were not making it officially?—A. At that time I made it as an official of the American Automobile Association contest board division. The reports were turned in as such, but for the certification to be used for any advertising purposes, it was not given because they would not certify any runs after that annual meeting date, which suspended operations.

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Q. Wait a minute. It was never accepted or certified as an official test?—A. I believe it was accepted, and I think there is some correspondence that probably Mr. Decker has that it was accepted, but they would not permit any advertising, because the war was on.

Q. Let me see if I understand you. You said it was denied certification as an official test?—A. I said it was denied certification to be used in conjunction with any advertising (Tr. 447, line 7 to 448, line 5).

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